TeeJay Publishers

Mathematics

National N4-1

a cornerstone in Scottish Education

TeeJay Publishers

National 4 Book N4-1

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National 4 Textbook N4-1

Produced by members of the TeeJay Writing Group

T Strang, J Geddes and J Cairns.

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PUPIL BOOK

N4-1

National 4 Textbook

The book, along with our CfE Book N4-2 forms the basis of a two year course following the outcomes for **National 4** as outlined by Education Scotland and the SQA.

- Book N4-1 is closely based around our very successful General Book 3G, of which we have sold over 120 000 to date. The new book has been colourised, the money topics have been updated to reflect modern prices, and the topics from our 3G extension pack have been embedded as core material.

- The assumption is that pupils embarking on this course will have been successful at CfE Level 2 and may have touched upon some of the materials in Level 3.

- As a guide, Book N4-1 might be started with most pupils at the beginning of, or part way through S3 as a precursor to completing N4-2 in S4.

- There are no A and B exercises. The 2 books cover the **entire National 4 course** without the teacher having to pick and choose which questions to leave out and which exercises are important. They all are !

- Pupils who cope well with the contents of these National 4 textbooks should be able to be assessed at various stages throughout the course and be ready to sit any end-of-unit or end-of-course assessments or examinations.

- The book contains an 8 page "**Chapter Zero**", which primarily revises all those strands from CfE Level 2 that have been covered in our CfE Books 2a and 2b.

- Topics which have been completed in Book N4-1, are reintroduced as *Review Exercises* in Book N4-2, to help with consolidation and revision.

- Each chapter has a "**What Have I Learned**" exercise as a summary.

- Many topics come in two chapters (e.g. **Area 1** and **Area 2**) to help split up lengthy pieces of work and the **WHIL's** in the 2nd chapter revise the work of both.

- **Homework** will be developed as a photocopiable pack.

- **TeeJay** is developing a **National 4 Assessment Pack**, similar to our CfE Assessment Packs. These will consist of Topic Assessments and Unit Assessments, as well as an end-of-course Diagnostic Assessment and Specimen Exam Papers.

T Strang, J Geddes, J Cairns

(March 2013)

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Book (N4-1)

* *The notation used to define the outcomes is drawn from TeeJay's National 4 Course planner, downloadable from our website :-* ***www.teejaypublishers.co.uk.***

National 4 - Schematic

Though not recommended, some schools may wish to follow closely, and in precise order, the actual outcomes as they are stated in the official SQA Document. Here is a schematic leading you through those outcomes :-

Expressions and Formulae covered in :-		N4-1	N4-2
E1.1	Using the Distributive Law	Ch 7	Review 1/Ch 17
E1.2	Factorising	-	Ch 17
E1.3	Simplifying Expressions	Ch 7	Review 12
E1.4	Evaluating Expressions	-	Ch 14
E1.5	Extending Patterns	Ch 16	Review 13/Ch 15
E1.6	Gradients of Lines	-	Ch 4
E2·1	Circumference and Area of a Circle	Ch 9	Review 9/Ch 11
E2·2	Area of Parallelogram,Kite/Rhombus/Trapezium	Ch 14/Ch 26	Review 5
E2·3	Surface Area of a Prism	-	Ch 6
E2·4	Volume of a Prism	-	Ch 8
E2·5	Rotational Symmetry	-	Ch 3
E3·1	Constructing Frequency Tables	-	Ch 16
E3·2	Determine Statistics of a Data Set	Ch 12	-
E3·3	Interpreting Calculated Statistics	Ch 24	-
E3·4	Constructing Diagrams to represent Raw Data	Ch 12/Ch 24	Ch 16
E3·5	Using Probability	Ch 17	-

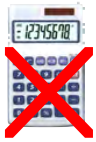
Relationships covered in :-		N4-1	N4-2
R1.1	Drawing & Recognising a graph of a Linear Equation	-	Ch 4
R1.2	Solving Linear Equations and Inequalities	Ch 7/Ch 22	Ch 4
R1.3	Changing the Subject of a Formula	-	Review 12/Ch 14
R2.1	Using Pythagoras Theorem	Ch 13/Ch 25	Review 4
R2.2	Using Fractional Scale Factor to Enlarge/Reduce Shapes	Ch 5/Ch 21	Review 14
R2.3	Use Properties of Shapes to Calculate Angles	Ch 2	Ch 7/Ch 13/Rev 11
R3.1	Calculating the Side of a Right Angled Triangle using Trig	-	Ch 5/Ch 9/Rev 15
R3.2	Calculating an Angle in a Right Angled Triangle using Trig	-	Ch 5/Ch 9
R4.1	Construct a Scattergraph	Ch 12	-
R4.2	Drawing a Line of Best Fit in a Graph	-	Ch 16

Numeracy covered in :-		N4-1	N4-2
N1.1	Selecting/Using Appropriate Numerical Notation and Units	Ch 1/3/6/10/15/19	Rev 2/3/6/Ch 1
N1.2	Selecting and Carrying out Calculations involving Whole Numbers, Fractions, Decimals, Percentages Ratio and Proportion	Ch 1/3/4/6/8.... ....Ch 10/11/14/15.... ....Ch 18/20/23	Review 7/8/10.... ....Ch 2/12/18
N1·3	Reading Measurements using Straightforward Scale	Practical	Practical
N1·4	Interpret results of calculations to make Decisions	Throughout Book	Throughout Book
N2·1	Extracting and Interpreting Data from at least two different Straightforward Graphical Forms including Stem-and-Leaf Diagrams	Throughout Book Ch 12	Throughout Book -

CHAPTER 0

These first 8 pages cover most of the work you have probably met already.

Revision



1. Learn your tables **now** - they are a must !!.

2 x 2 = 4	3 x 2 = 6	4 x 2 = 8	5 x 2 = 10
2 x 3 = 6	3 x 3 = 9	4 x 3 = 12	5 x 3 = 15
2 x 4 = 8	3 x 4 = 12	4 x 4 = 16	5 x 4 = 20
2 x 5 = 10	3 x 5 = 15	4 x 5 = 20	5 x 5 = 25
2 x 6 = 12	3 x 6 = 18	4 x 6 = 24	5 x 6 = 30
2 x 7 = 14	3 x 7 = 21	4 x 7 = 28	5 x 7 = 35
2 x 8 = 16	3 x 8 = 24	4 x 8 = 32	5 x 8 = 40
2 x 9 = 18	3 x 9 = 27	4 x 9 = 36	5 x 9 = 45

6 x 2 = 12	7 x 2 = 14	8 x 2 = 16	9 x 2 = 18
6 x 3 = 18	7 x 3 = 21	8 x 3 = 24	9 x 3 = 27
6 x 4 = 24	7 x 4 = 28	8 x 4 = 32	9 x 4 = 36
6 x 5 = 30	7 x 5 = 35	8 x 5 = 40	9 x 5 = 45
6 x 6 = 36	7 x 6 = 42	8 x 6 = 48	9 x 6 = 54
6 x 7 = 42	7 x 7 = 49	8 x 7 = 56	9 x 7 = 63
6 x 8 = 48	7 x 8 = 56	8 x 8 = 64	9 x 8 = 72
6 x 9 = 54	7 x 9 = 63	8 x 9 = 72	9 x 9 = 81

2. **Copy** these and do them (without a calculator) :-

a $\begin{array}{r} 219 \\ +\ 782 \\ \hline \end{array}$ **b** $\begin{array}{r} 6145 \\ +\ 4587 \\ \hline \end{array}$ **c** $\begin{array}{r} 8017 \\ -\ 1269 \\ \hline \end{array}$ **d** $\begin{array}{r} 8000 \\ -\ 218 \\ \hline \end{array}$

e $\begin{array}{r} 217 \\ \times\ 7 \\ \hline \end{array}$ **f** $\begin{array}{r} 807 \\ \times\ 8 \\ \hline \end{array}$ **g** 5127 x 4 **h** 6 x 2143

i $5\overline{)8015}$ **j** $6\overline{)2034}$ **k** $\frac{603}{9}$ **l** 3504 ÷ 8.

3. Find :- **a** 8^2 **b** 10^2 **c** 20^2.

4. Write down the answers to :-

a 10 x 17	**b** 23 x 10	**c** 116 x 10	**d** 100 x 37
e 213 x 100	**f** 1000 x 15	**g** 365 x 1000	**h** 2890 ÷ 10
i 5700 ÷ 10	**j** 3800 ÷ 100	**k** 215 000 ÷ 100	**l** 265 000 ÷ 1000.

To find the answer to **40 x 63**, do it in **two** steps as follows :-

Step 1 :- find 10 x 63 first (= 630)

Step 2 :- then find 4 x 630 = **2520**

5. Find answers to the following using, the **two** steps shown on the previous page :-

a 20 x 18 **b** 30 x 43 **c** 60 x 24 **d** 115 x 30

e 90 x 31 **f** 213 x 50 **g** 90 x 113 **h** 603 x 70

i 200 x 81 [First, find 100 x 81 (= 8100), then find 2 x 8100 (= .....)]

j 300 x 42 **k** 31 x 400 **l** 123 x 700 **m** 2000 x 38.

To find **2160 ÷ 40**, do it in **TWO** steps as follows :-

Step 1 :- find 2160 ÷ 10 first (= 216)

Step 2 :- then find 216 ÷ 4 =>

$$4\overline{)216} = 54$$

6. Find answers to the following using the **TWO** steps shown above :-

a 320 ÷ 20 **b** 720 ÷ 40 **c** 1320 ÷ 30 **d** 6500 ÷ 50

e 2240 ÷ 70 **f** 16 800 ÷ 80 **g** 65 400 ÷ 60 **h** 1 750 000 ÷ 50

i 2800 ÷ 400 [First, find 2800 ÷ 100 (= 28), then find 28 ÷ 4 (= 7)]

j 6400 ÷ 200 **k** 15 600 ÷ 300 **l** 27 500 ÷ 500 **m** 7 920 000 ÷ 600.

7. Remember **BODMAS** ?

This helps you decide which order to carry out calculations.

The answer to :-

2 + 3 x 4 is **not** 20

=> 2 + 3 x 4 = 2 + 12 = **14**

B brackets - (always do these first)

O of (as in $\frac{1}{2}$ of 18)

D divide } do these before add/subtract

M multiply }

A add } do these LAST

S subtract }

Do the following (no calculator) :-

a What is the answer to 3 + 2 x 4 **(i)** 20 or **(ii)** 11 ?

b What is the answer to 5 + 3 x 3 **(i)** 24 or **(ii)** 14 ?

c What is the answer to 12 – 2 x 4 **(i)** 4 or **(ii)** 40 ?

d What is the answer to 4 x (6 – 2) **(i)** 16 or **(ii)** 22 ?

e 16 + 4 x 3 **f** 5 x 7 – 1 **g** 10 + 4 ÷ 2 **h** 3 + 4 x 2

i 3 + (4 x 2) **j** (3 + 4) x 2 **k** $\frac{1}{2}$ of 6 + 4 **l** $\frac{1}{2}$ of (6 + 4).

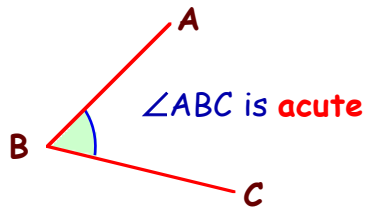
8. **a** A car travels 15 kilometres on 1 litre of fuel. How far will it go on 20 litres ?

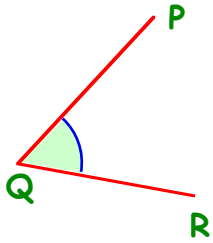
b 30 identical sacks of potatoes weigh 480 kilograms. What does 1 sack weigh ?

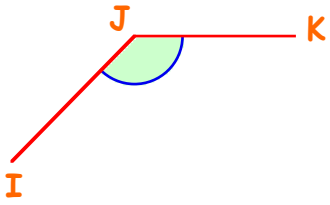
c How much smaller is 17 x 20 than 14 x 30 ?

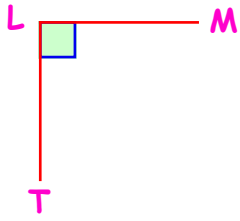
d What is the sum of the first 10 :- **(i)** **odd** numbers **(ii)** **even** numbers ?

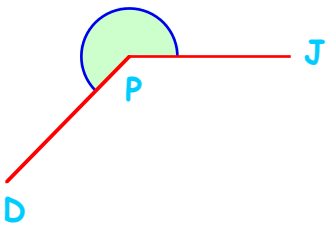
9. Use the words :- **acute**, **right**, **obtuse**, **straight**, **reflex** to describe these angles :-

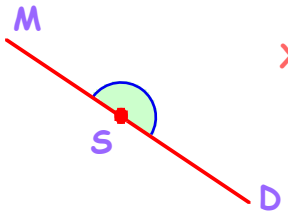


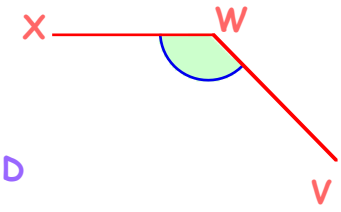


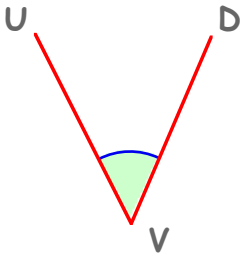




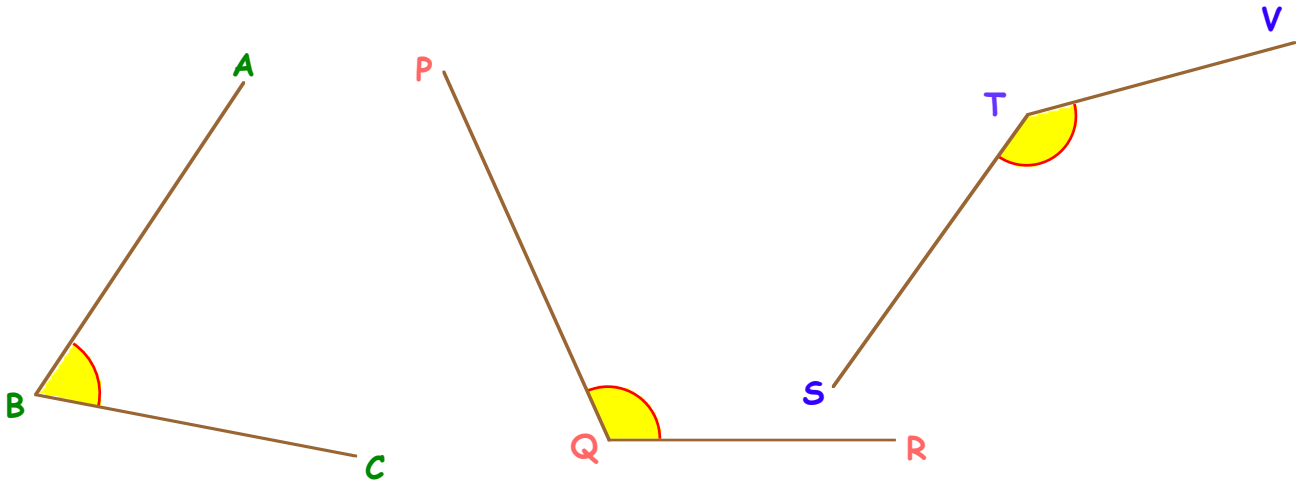








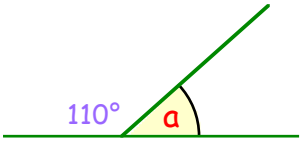
10. Use a protractor to measure these angles :-

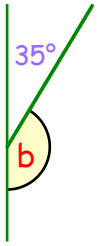


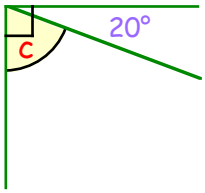
11. Use a protractor to draw these angles (label them) :-

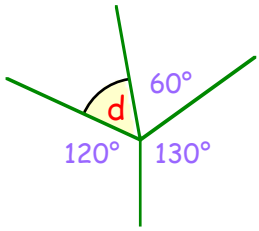
a ∠DEF = 23° **b** ∠IJK = 71° **c** ∠SAT = 152°.

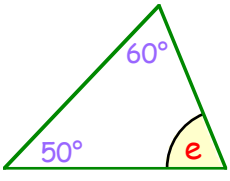
12. Calculate the size of each angle labelled **a**, **b**, **c**, ...

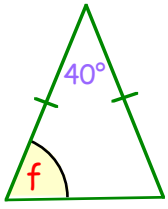


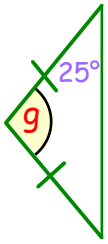


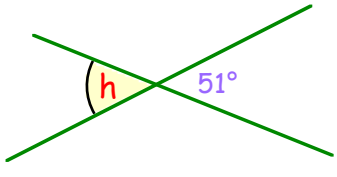






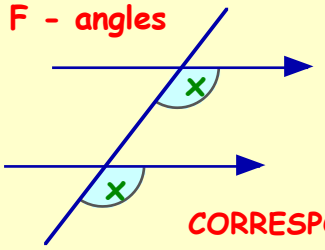






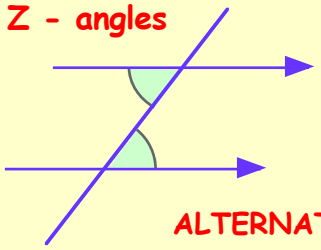
Remember :-

F - angles



CORRESPONDING angles are equal

Z - angles



ALTERNATE angles are equal

13. In the figure opposite, which angle is :-

a corresponding to **a**

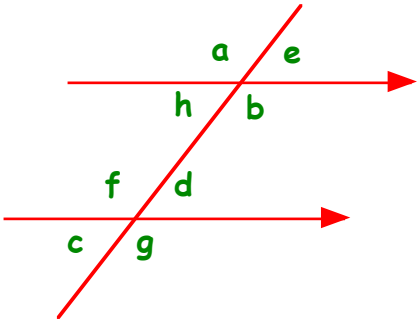
b corresponding to **b**

c alternate to **h**

d alternate to **f**

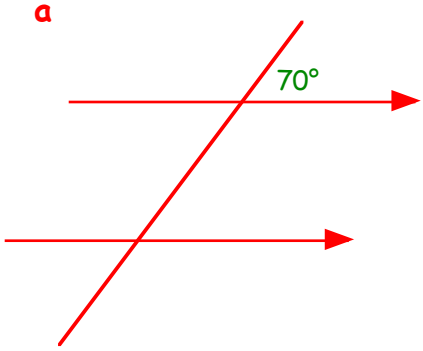
e vertically opposite **f**

f corresponding to **c** ?

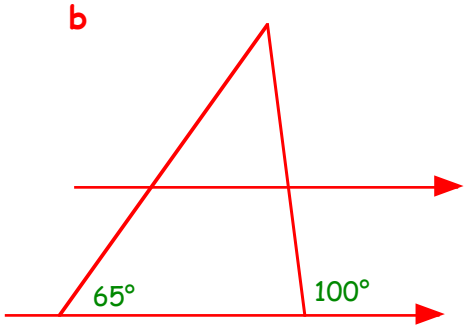


14. Sketch these figures and fill in the sizes of **all** the missing angles :-

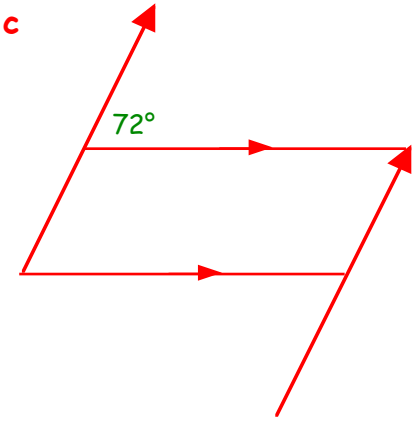
a



b



c



15. Tidy up these expressions :-

a $3x + 4x$ **b** $5a - 2a$ **c** $3p + p$ **d** $m + m + m + m$

e $8t - t$ **f** $3 \times 2x$ **g** $5 \times 5m$ **h** $10 \times 3g$.

16. Tidy these expressions (as far as possible) :-

a $2a + 3b + 5a + 7b$ **b** $6p + 8q - 2p + 5q$

c $2m + 7n - m + n$ **d** $8x + 7 - 2x + 5$

e $5y - 4 + 3y + 10$ **f** $2t + 3 + 5t$.

Remember :-

$2(x + 3) = 2 \times x + 2 \times 3$

$= 2x + 6$

(not $2x + 3$)

$5(2x - 7) = 5 \times 2x - 5 \times 7$

$= 10x - 35$

(not $10x - 7$)

17. Multiply to remove the brackets :-

a $3(x + 4)$ **b** $5(x - 2)$ **c** $4(a + 3)$ **d** $10(p - 2)$

e $2(3x + 5)$ **f** $4(5x - 3)$ **g** $6(2 + 3x)$ **h** $8(4 - 3a)$.

18. In this question $a = 6$, $b = 5$ and $c = 3$.

Find the value of :-

a $a - b$ **b** $a + b - c$ **c** $3a$ **d** $4b$

e $2c - a$ **f** ab (means $a \times b$) **g** bc **h** b^2.

19. Find the following without a calculator :- (*knowing your tables helps*)

a $\frac{1}{2}$ of 18 **b** $\frac{1}{4}$ of 204 **c** $\frac{1}{3}$ of 162 **d** $\frac{1}{8}$ of 2064

e $\frac{2}{3}$ of 24 [find $\frac{1}{3}$ (by dividing by 3) then x 2]

f $\frac{3}{4}$ of 40 **g** $\frac{2}{5}$ of 165 **h** $\frac{9}{10}$ of 400 **i** $\frac{7}{8}$ of 160.

20. Here are some simple **percentages** you should know as **fractions**. **Learn them !!**

50%	= $\frac{1}{2}$	(divide by 2)	25%	= $\frac{1}{4}$	(divide by 4)
20%	= $\frac{1}{5}$	(divide by 5)	10%	= $\frac{1}{10}$	(divide by 10)
$33\frac{1}{3}$%	= $\frac{1}{3}$	(divide by 3)	1%	= $\frac{1}{100}$	(divide by 100)
75%	= $\frac{3}{4}$	(divide by 4 then x 3)	$66\frac{2}{3}$%	= $\frac{2}{3}$	(divide by 3 then x 2)
5%	= $\frac{1}{20}$	(find 10% and divide by 2)	40%	= $\frac{2}{5}$	(divide by 5 then x 2)

Do these **mentally** and write down the answers to :-

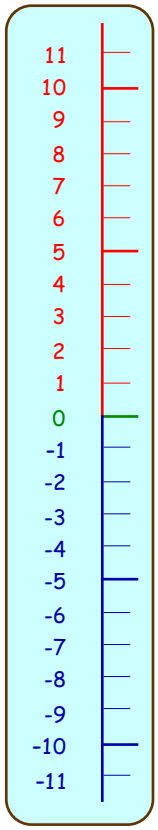
a 50% of 18 **b** 25% of 36 **c** 10% of 230 **d** $33\frac{1}{3}$% of 120

e 20% of 45 **f** 5% of 80 **g** 75% of 60 **h** $66\frac{2}{3}$% of 24

i 2% of 350 **j** 40% of 50 **k** 1% of 2600 **l** 100% of 18.

21. Use the thermometer scale shown opposite to help with these.

Remember :- - if you add a (+) number → move **up**
- if you add a (–) number → move **down**
- if you **subtract** a number → move **down**



DO NOT mark this scale

a 12 – 2 **b** 2 – 12 **c** (-1) + 5

d 6 + (-4) **e** 3 + (-5) **f** -2 – 6

g (-4) + (-6) **h** (-11) + 15 **i** 10 – 15

j 0 – 3 **k** (-8) + 8 **l** (-11) + 6

m 2 x (-3) **n** 5 x (-9) **o** (-8) x 4.

22. What is the number that is :-

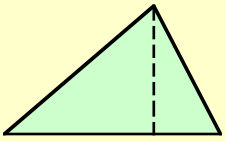
a 6 bigger than -2 **b** 8 smaller than 1

c 5 bigger than -8 **d** 4 smaller than -3 ?

Rectangle

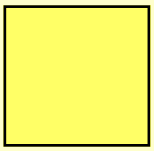
Area = length x breadth

Triangle



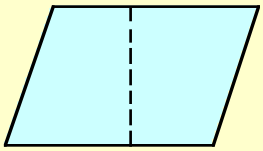
Area = $\frac{1}{2}$ base x height

Square



Area = length x length

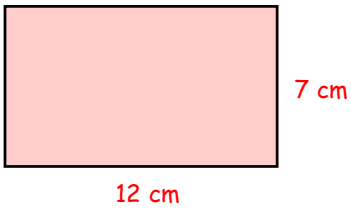
Parallelogram



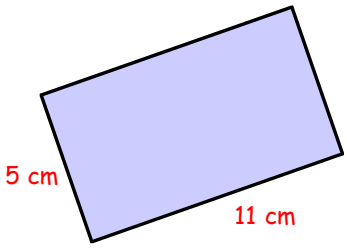
Area = base x height

23. Calculate the **areas** of the following, using the formulae above :-

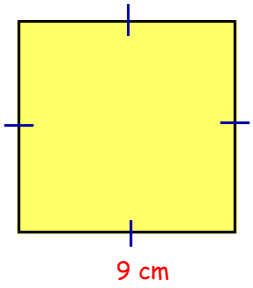
a



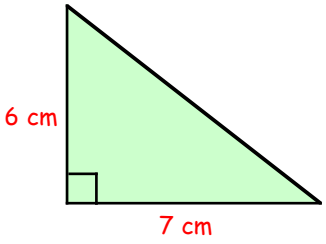
b



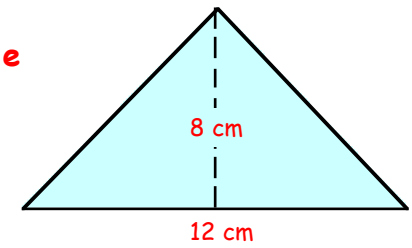
c



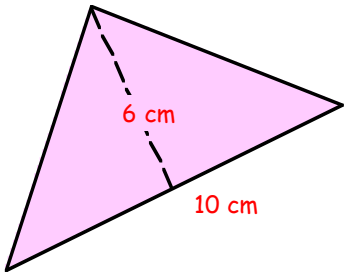
d



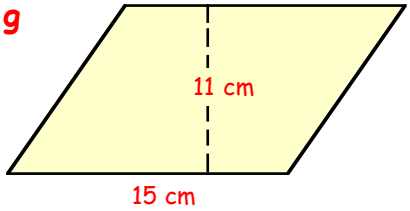
e



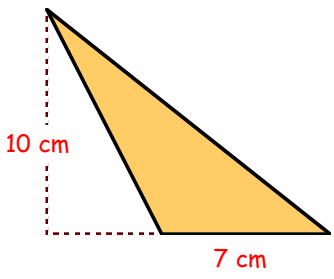
f



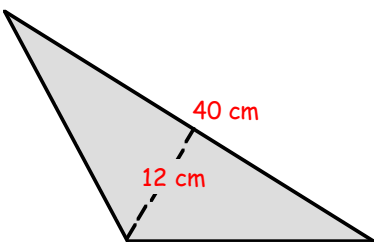
g



h



i



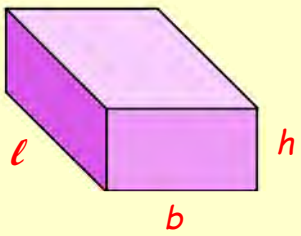
Remember :-

Volume = length x breadth x height

1 cm^3 = 1 ml

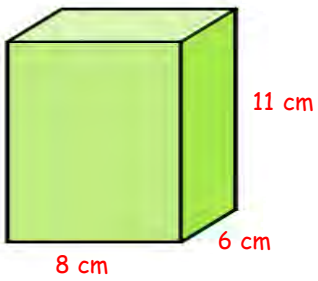
1000 cm^3 = 1000 ml = 1 litre

$$V = \ell \times b \times h$$

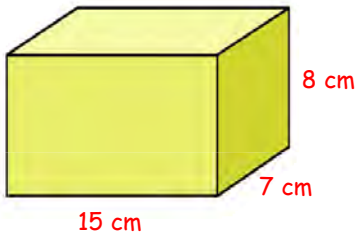


24. Calculate the volumes (in cm^3) of the following cuboids :-

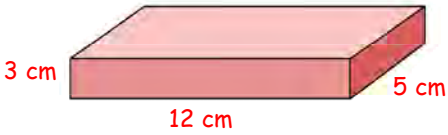
a



b

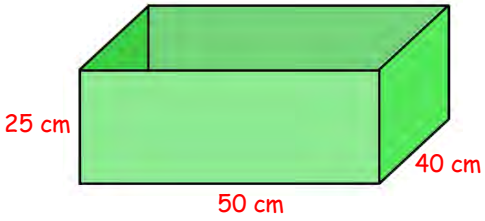


c



d **(i)** Calculate the volume of this container (in cm^3).

(ii) How many **litres** does it hold when full ?



25. Solve for x :- (*see opposite how to possibly set down*)

a $x + 2 = 7$ **b** $x - 3 = 5$ **c** $x - 6 = 6$

d $x + 10 = 21$ **e** $x - 5 = 0$ **f** $x + 8 = 6$.

$$x - 6 = 10$$
$$x = 10 + 6$$
$$x = 16$$

26. Solve for x :- (*see opposite how to possibly set down*)

a $3x = 15$ **b** $5x = 50$ **c** $4x = 100$

d $7x = 56$ **e** $6x = 360$ **f** $2x = 17$.

$$2x = 16$$
$$x = \frac{16}{2}$$
$$x = 8$$

27. Solve for x :- (*see opposite how to possibly set down*)

a $2x + 1 = 21$ **b** $2x + 2 = 20$ **c** $5x - 1 = 14$

d $7x + 17 = 38$ **e** $8x - 8 = 0$ **f** $4x + 4 = 4$

g $6x - 2 = 34$ **h** $10x + 20 = 20$ **i** $9x - 9 = 9$.

$$2x - 3 = 11$$
$$2x = 11 + 3$$
$$2x = 14$$
$$x = 7$$

This is where knowing your **tables** really helps.

Example :- To simplify the fraction $\frac{14}{21}$ (look for a number that will divide into 14 and 21).

Since 14 and 21 are in the "7 times" table => $\frac{14 \div 7}{21 \div 7} = \frac{2}{3}$.

28. **Simplify** these fractions :-

a $\frac{10}{15}$	**b** $\frac{6}{12}$	**c** $\frac{20}{50}$	**d** $\frac{9}{15}$
e $\frac{4}{16}$	**f** $\frac{18}{24}$	**g** $\frac{33}{44}$	**h** $\frac{21}{35}$.

29. "**The factors of 6**" are all the (*smaller*) numbers that **divide into** 6 **exactly**.

=> The factors of 6 are {1, 2, 3, 6}.

Find all the factors of :-

a 5	**b** 8	**c** 12	**d** 15
e 21	**f** 20	**g** 24	**h** 50
i 13	**j** 11	**k** 16	**l** 18.

A **PRIME** number is a special type of number.

A prime number is a number that only has **two factors** - itself (and 1).

Example 1 :- 7 has **only** 2 factors - 7 (and 1) => 7 **is** a prime number.

Example 2 :- 8 has **more** than 2 factors - (8 and 1 and **2** and **4**) => 8 **is not** a prime number.

30. Take your time here !! Decide which of these are prime numbers :-

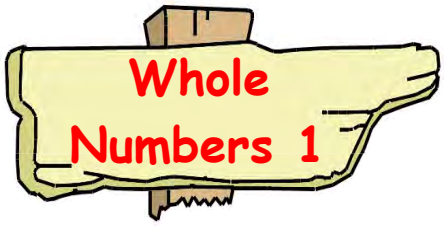
a 2	**b** 5	**c** 6	**d** 9
e 11	**f** 13	**g** 15	**h** 21
i 10	**j** 19	**k** 24	**l** 25.

31. Write down **all** the prime numbers under 30.

Now you are ready for the National 4 Course.
Don't worry if you have forgotten some of the work in this Chapter - much of it will be reintroduced later on.

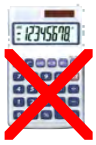
Good Luck !

CHAPTER 1



Rounding to the Nearest Whole Number

Exercise 1



1. Rounding to the nearest whole number → 17·6 → 18

Copy these and round to the nearest whole number :-

a	2·8	b	7·7	c	4·9	d	16·3	e	29·7
f	62·1	g	14·5	h	3·17	i	23·41	j	72·81
k	63·99	l	27·09	m	8·125	n	42·495	o	86·500.

2. Round to the nearest second :-

a	16·3 sec	b	22·8 sec	c	14·4 sec	d	96·1 sec
e	77·8 sec	f	39·6 sec	g	3·45 sec	h	61·72 sec
i	29·97 sec	j	63·5 sec	k	0·71 sec	l	40·04 sec.

3. Using a calculator →

63 ÷ 8 = 7·875 (*check*)
= **8** to the nearest whole number

Do these on a calculator, **then** round your answer to the nearest whole number :-

a	93 ÷ 7	b	50 ÷ 11	c	139 ÷ 4	d	653 ÷ 8
e	1023 ÷ 52	f	4165 ÷ 51	g	989 ÷ 54	h	3456 ÷ 89.

Rounding to the Nearest 10, 100 or 1000

Exercise 2

1. Round to the nearest 10 :-

a	78	b	62	c	18	d	45	e	59
f	82	g	64	h	83	i	7	j	15
k	264	l	249	m	736	n	902	o	2008.

2. Round to the nearest 10 cm :-

a	38 cm	b	61 cm	c	75 cm	d	82 cm	e	89 cm
f	152 cm	g	347 cm	h	608 cm	i	725 cm	j	501 cm.

3. Round to the nearest 100 :-

a	131	b	541	c	817	d	194	e	550
f	777	g	364	h	83	i	5490	j	3623
k	6581	l	4250	m	7070	n	3382	o	5445.

4. Round to the nearest 1000 :-

a	8700	**b**	14 200	**c**	23 830	**d**	19 940	**e**	63 497
f	63 503	**g**	1871	**h**	44 486	**i**	65 720	**j**	83 481
k	69 675	**l**	123 800	**m**	215 395	**n**	146 609	**o**	299 763.

Using Rounding to Find Estimates

It is possible to estimate **mentally** the answer to a question by rounding the numbers to "**1 figure accuracy**".

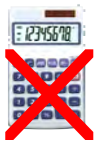
Example :-

is approximately

786 ÷ 19
800 ÷ 20
≈ 80 ÷ 2 ≈ **40**.

39 x 213
is approximately
40 x 200
≈ 8000

Knowing your tables will help here !



Exercise 3

1. Find approximate answers to these by first rounding each number to 1 figure accuracy : -

a	48 x 48	**b**	37 x 62	**c**	57 x 98	note !	**d**	197 x 42	
e	307 x 48	**f**	284 x 187	**g**	598 ÷ 29		**h**	788 ÷ 37	
i	1987 ÷ 206	**j**	2865 ÷ 12	**k**	7965 ÷ 42		**l**	5826 ÷ 28.	

2. The answer to 98 x 21 is either {208, 2058 or 25 058}. (*no calculator !*)

By rounding 98 x 21 = 100 x ..... = ... , decide which of the 3 answers is likely to be the correct one.

3. By rounding your numbers before multiplying, decide which of the 3 given answers is most likely to be the correct one :-

a	39 x 31	Choice of	{12·9, 129 or 1209}
b	71 x 18	Choice of	{128, 1278 or 12 778}
c	197 x 61	Choice of	{1207, 12 017 or 120 117}
d	398 x 19	Choice of	{72, 752 or 7562}.

Multiplication by 10, 100, 1000

Learn these rules .....

Example :-

117 x 10 = 1170

Simple Rule for Whole Numbers :-

If you multiply by 10, simply add a 0 at the end.

If you multiply by 100, simply add two 0's at the end.

If you multiply by 1000, simply add three 0's at the end.

Exercise 4

1. Write down the answers to these :-

a	17 x 10	**b**	8 x 10	**c**	29 x 10	**d**	10 x 64
e	10 x 81	**f**	115 x 10	**g**	10 x 233	**h**	10 x 120
i	960 x 10	**j**	908 x 10	**k**	10 x 1234	**l**	7608 x 10.

2. Write down the answers to these :-

a	16 x 100	**b**	37 x 100	**c**	100 x 81	**d**	100 x 60
e	123 x 100	**f**	100 x 237	**g**	100 x 450	**h**	206 x 100.

3. Write down the answers to these :-

a	8 x 1000	**b**	23 x 1000	**c**	56 x 1000	**d**	1000 x 84
e	1000 x 70	**f**	125 x 1000	**g**	1000 x 260	**h**	1000 x 300.

Division by 10, 100, 1000

Learn these rules .....

Example :-

8200 ÷ 10 = 820

Simple Rule for Whole Numbers :-

If you divide by 10, simply remove the last 0.

If you divide by 100, simply remove the last **two** 0's.

If you divide by 1000, simply remove the last **three** 0's.

Exercise 5

1. Write down the answers to these :-

a	90 ÷ 10	**b**	60 ÷ 10	**c**	120 ÷ 10	**d**	470 ÷ 10
e	990 ÷ 10	**f**	1200 ÷ 10	**g**	6300 ÷ 10	**h**	4820 ÷ 10
i	1000 ÷ 10	**j**	23 000 ÷ 10	**k**	46 300 ÷ 10	**l**	12 870 ÷ 10.

2. Write down the answers to these :-

a	400 ÷ 100 = ...	**b**	800 ÷ 100	**c**	1600 ÷ 100	**d**	4700 ÷ 100
e	9000 ÷ 100	**f**	14 000 ÷ 100	**g**	23 000 ÷ 100	**h**	65 400 ÷ 100.

3. Write down the answers to these :-

a	8000 ÷ 1000	**b**	14 000 ÷ 1000	**c**	29 000 ÷ 1000	**d**	40 000 ÷ 1000
e	135 000 ÷ 1000	**f**	180 000 ÷ 1000	**g**	270 000 ÷ 1000	**h**	300 000 ÷ 1000.

Multiplication by Multiples of 10, 100, 1000

To multiply **84 x 20**

Step 1 Find 84 x 10 = 840

Step 2 Now find

$$\begin{array}{r} 840 \\ \times\ 2 \\ \hline 1680 \end{array}$$

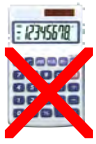
To multiply **124 x 300**

Step 1 Find 124 x 100 = 12 400

Step 2 Now find

$$\begin{array}{r} 12\,400 \\ \times\ 3 \\ \hline 37\,200 \end{array}$$

Exercise 6



1. Calculate each of these, using the same method shown above :-

   a 32 x 30 (*Find 10 x 32 first = 320 and then find 320 x 3*).

   b 17 x 40 **c** 21 x 60 **d** 31 x 70

   e 42 x 80 **f** 113 x 50 **g** 214 x 20.

2. Work out each of these, using the 2 steps shown :-

   a 24 x 200 (*Find 24 x 100 first = 2400 and then find 2400 x 2*).

   b 31 x 300 **c** 13 x 500 **d** 18 x 700

   e 42 x 300 **f** 23 x 300 **g** 34 x 200

   h 400 x 13 **i** 800 x 211 **j** 2000 x 31.

Division by 20, 30, 500, etc.,

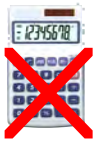
To divide **13 500 ÷ 30**

Step 1 Divide by 10 first $\frac{13500}{10}$ = 1350

Step 2 Now divide by 3

$$3\overline{)1350} \quad 450$$

Exercise 7



1. Do the following divisions, using the same method as shown above :-

   a 560 ÷ 20 (*Find 560 ÷ 10 = 56 and then find* $2\overline{)56}$).

   b 240 ÷ 30 **c** 1250 ÷ 50 **d** 2400 ÷ 80

   e 11 200 ÷ 40 **f** 3660 ÷ 60 **g** 12 000 ÷ 50.

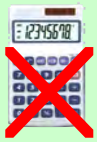
2. Divide the following :-

   a 12 300 ÷ 300 (Find *12 300 ÷ 100 = 123 and then find* $3\overline{)123}$).

   b 24 600 ÷ 200 **c** 12 800 ÷ 400 **d** 22 500 ÷ 500

   e 14 000 ÷ 200 **f** 16 000 ÷ 800 **g** 427 000 ÷ 700.

What Have I Learned ?



1. Round to the nearest whole number :-

a 71·8 **b** 19·54 **c** 102·4976.

2. Round to the nearest 10 :-

a 178 **b** 1324 **c** 87 547.

3. Round to the nearest 100 :-

a 1247 **b** 2360 **c** 104 961.

4. Round to the nearest 1000 :-

a 13 501 **b** 29 863 **c** 147 643.

5. By rounding each number first, find an **estimate** to :-

a 197 x 12 **b** 7865 ÷ 39 **c** $(19)^2$.

6. Write down the answer to :-

a 63 x 10 **b** 10 x 2060 **c** 13 x 100

d 100 x 307 **e** 1000 x 8 **f** 24 x 1000.

7. Use the "two-step" method to find :-

a 41 x 30 **b** 121 x 40 **c** 53 x 20

d 200 x 31 **e** 500 x 13 **f** 103 x 600.

8. Use the "two-step" method to find :-

a 1680 ÷ 40 **b** 4320 ÷ 20 **c** 13 500 ÷ 50

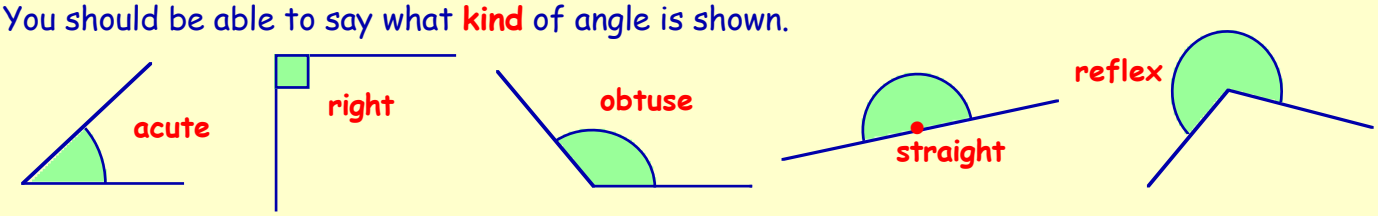
d 2400 ÷ 300 **e** 13 800 ÷ 200 **f** 126 000 ÷ 600.

CHAPTER 2

Angles

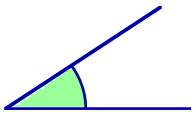
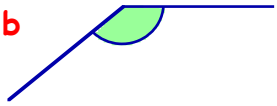
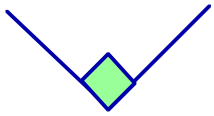
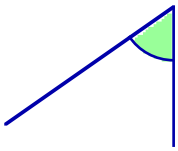
Types of Angles

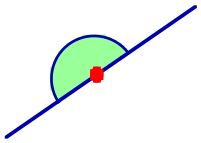
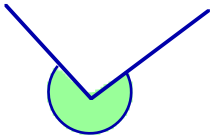
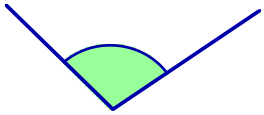
You should be able to say what **kind** of angle is shown.



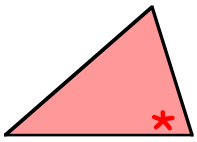
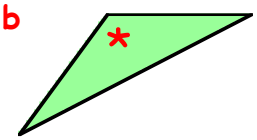
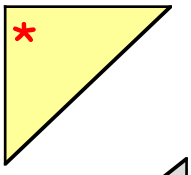
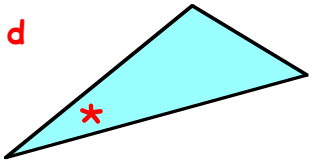
Exercise 1

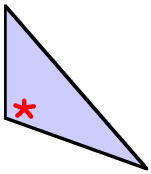
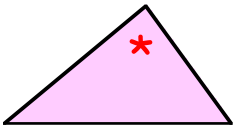
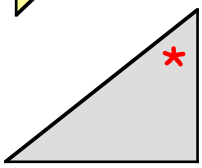
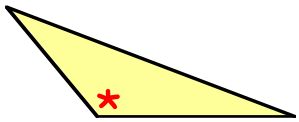
1. Use a word from acute, right, obtuse, straight, reflex to describe each of the angles shown below :-

a 
b 
c 
d 

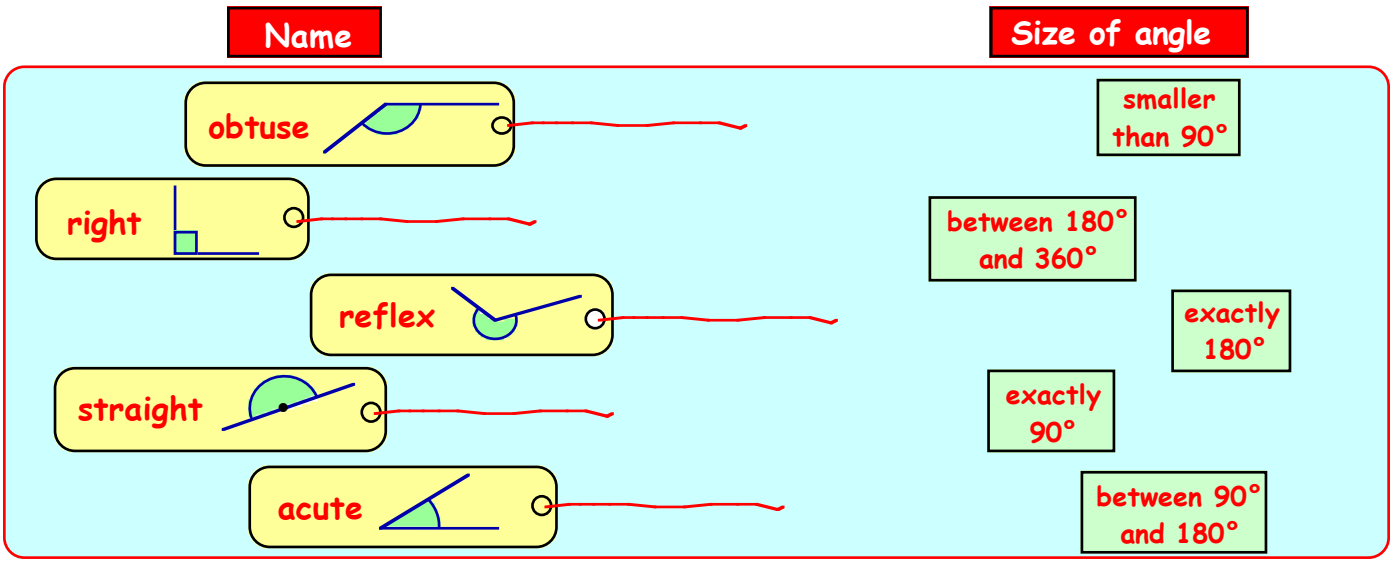
e 
f 
g 
h 

2. In each of the following triangles, state what kind of angle the one marked * is :-

a 
b 
c 
d 

e 
f 
g 
h 

3. **Copy** this diagram and match the type of angle with the correct size :-



4. Look at the angle sizes listed below :-

70°, 89°, 105°, 14°, 200°, 90°, 137°, 91°, 180°, 310°, 71°, 179°

a Which of the angles are acute ?

b Which of the angles are obtuse ?

c Which of the angles are right ?

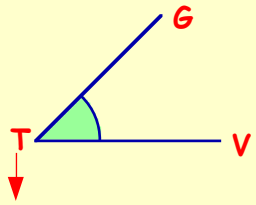
d Which of the angles are reflex ?

e Which of the angles are straight ?

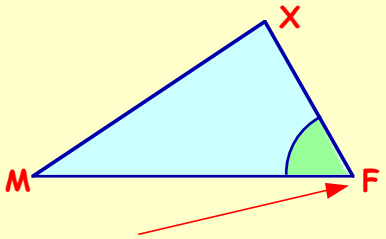
Naming Angles

You **MUST** use 3 letters every time to name an angle.

Always use CAPITAL letters



∠GTV (**T** is the middle letter)

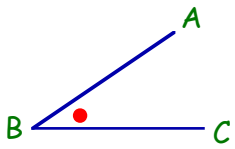


∠MFX (**F** is the middle letter)

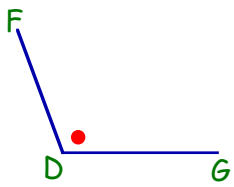
Exercise 2

1. Use 3 LETTERS to name each of the following angles :- (*remember the "∠" sign*).

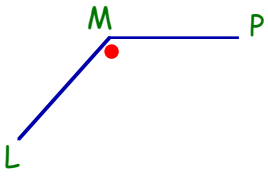
a



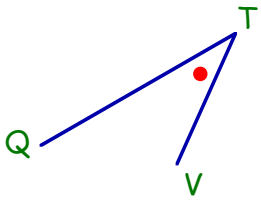
b



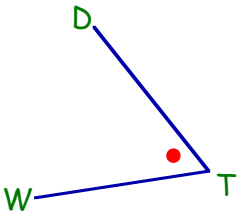
c



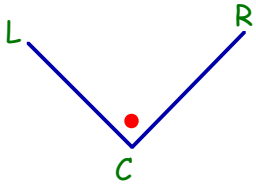
d



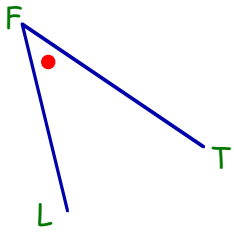
e



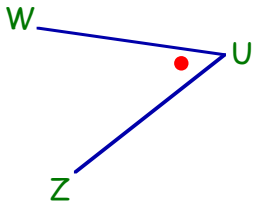
f



g

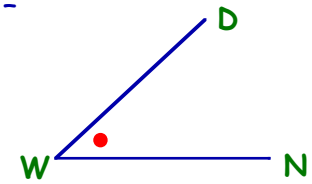


h



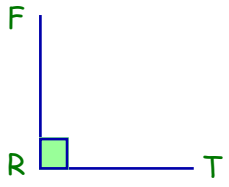
2. Name (using 3 letters) each angle and say what **TYPE** of angle it is :-

Example -

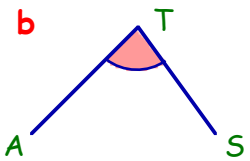


∠ **DWN** is an **acute** angle.

2. **a**



b



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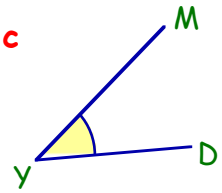
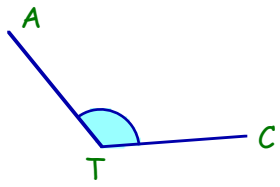
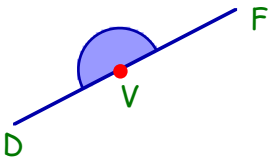


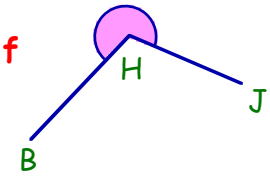
d



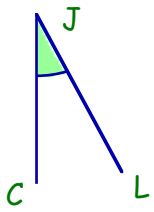
e



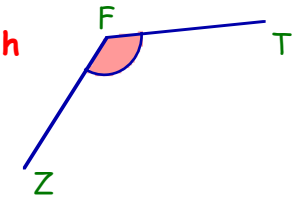
f



g

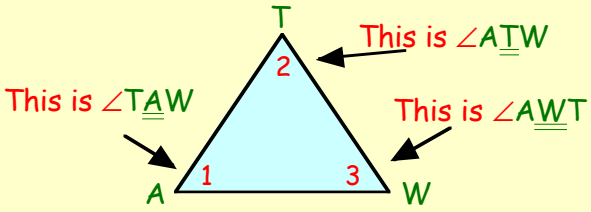


h

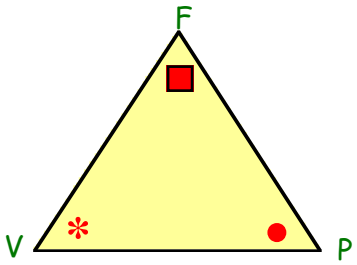


In each triangle, there are 3 angles.

You need to be careful how you name them.



3. **a**



b **(i)** Name the angle marked ■ .

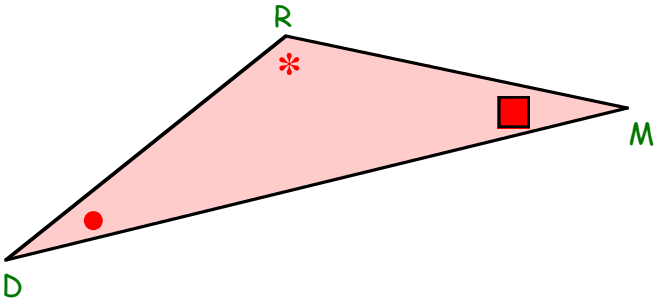
(ii) Name the angle marked ● .

(iii) Name the angle marked ✻ .

(i) Name the angle marked ✻ .

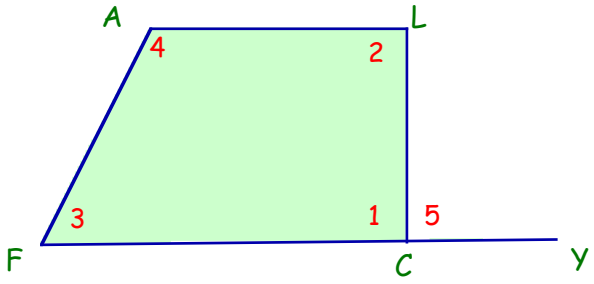
(ii) Name the angle marked ● .

(iii) Name the angle marked ■ .

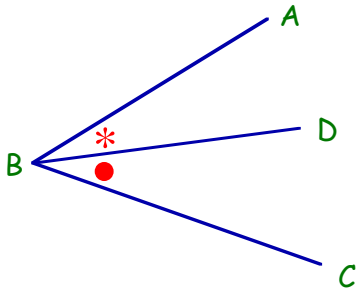


4. Angle **(1)** is called ∠LCF.

Name the other 4 angles.
(*Use 3 letters each time*).



5.



There are 3 angles in this figure.

The big one is ∠ABC.

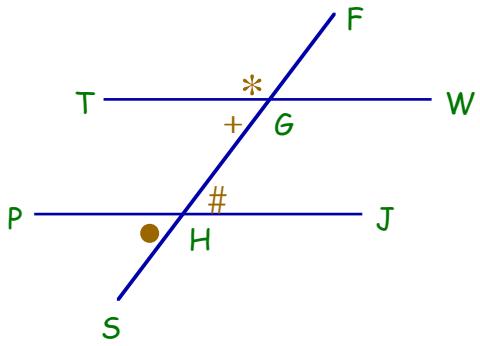
Name the angles marked :-

a ● **b** ✻ .

6. There are 8 angles in this figure.

Name the angle marked :-

a ● **b** * **c** + **d** # .



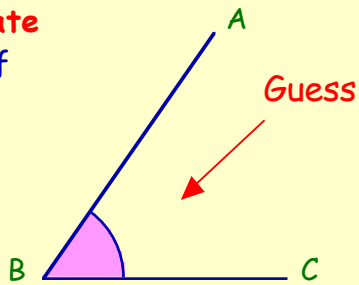
7. Neatly draw and label any **ACUTE** angle, ∠FMV.

8. Neatly draw and label any **RIGHT** angle, ∠TPH.

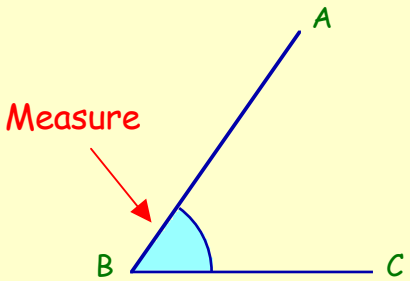
9. Neatly draw and label any **OBTUSE** angle, ∠DJW.

Measuring Angles

It helps to **estimate** roughly the size of the angle first.



(guess about 60°)



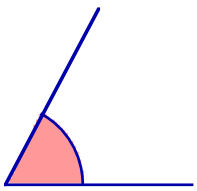
(actual size ∠ABC = 56°)

Exercise 3

1. Do **not** use a protractor in this question.

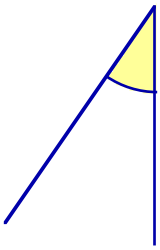
Choose the estimate closest to what you think the angle is :-

a



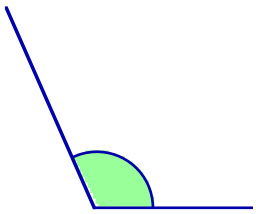
(i) 40°
(ii) 60°
(iii) 88°

b



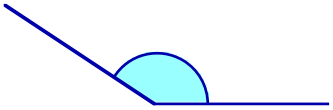
(i) 10°
(ii) 30°
(iii) 70°

c



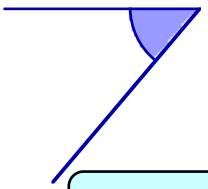
(i) 60°
(ii) 85°
(iii) 110°

d



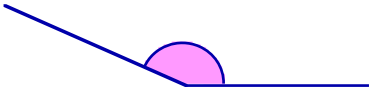
(i) 100°
(ii) 140°
(iii) 170°

e



(i) 15°
(ii) 50°
(iii) 75°

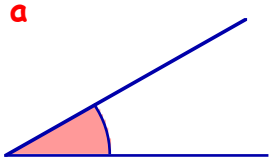
f



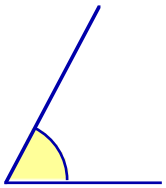
(i) 100°
(ii) 120°
(iii) 160°

2. Estimate the size of each angle here.
(*Try to get within 5° - 10° of the correct answer*). — **No Protractor** !!!

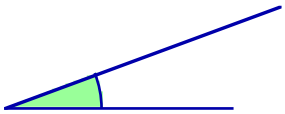
a



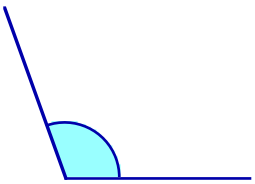
b



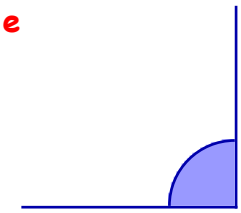
c



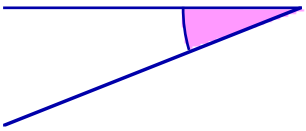
d



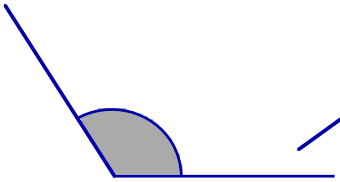
e



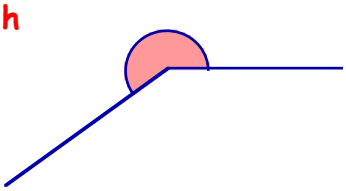
f



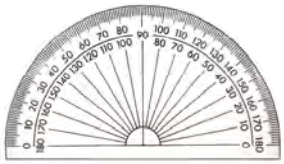
g



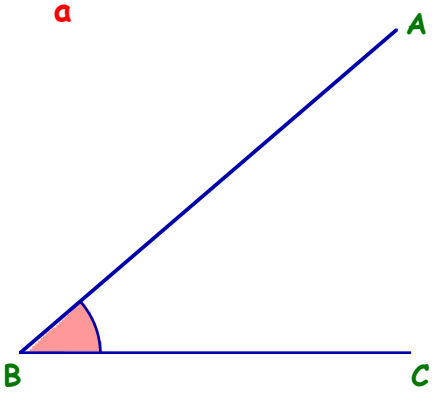
h



3. Use a **protractor** to measure the angles below :-
(*Estimate their sizes first in your head*).

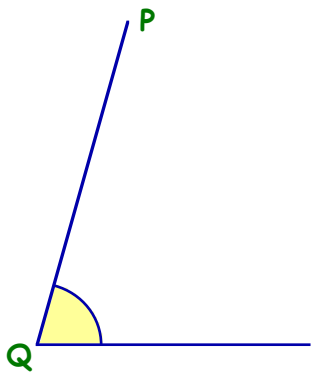


a



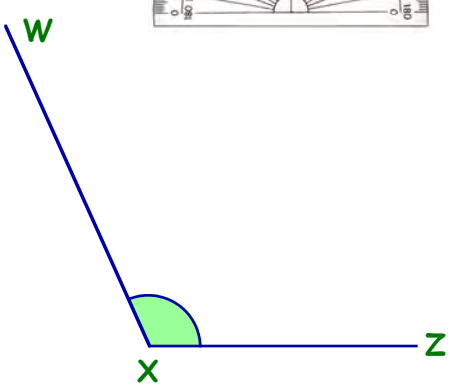
∠ABC = ...°

b



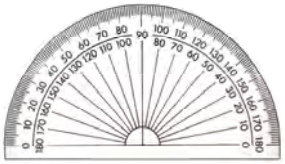
∠PQR = ...°

c



∠WXZ = ...°

(*Show these to your teacher **now** for checking*).

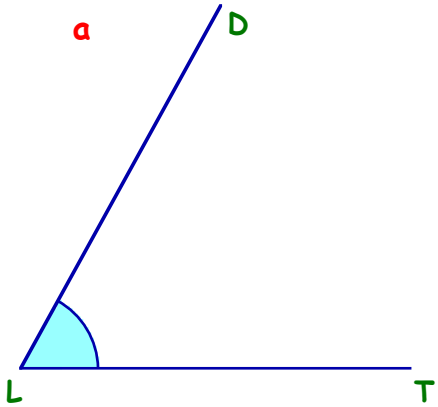


4. Now :- **(i)** name each angle here (*3 letters*).

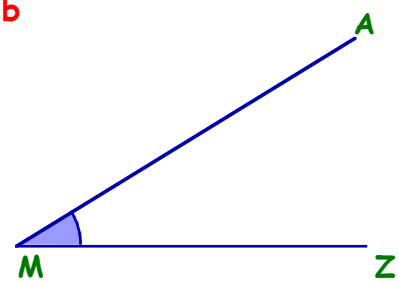
(ii) estimate its size (*in your head*).

(iii) measure the angle to the nearest degree using your protractor.

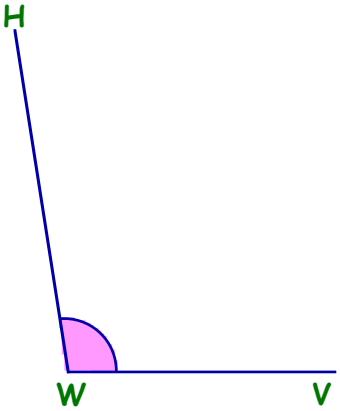
a



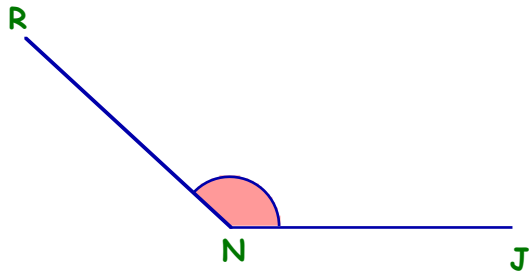
b



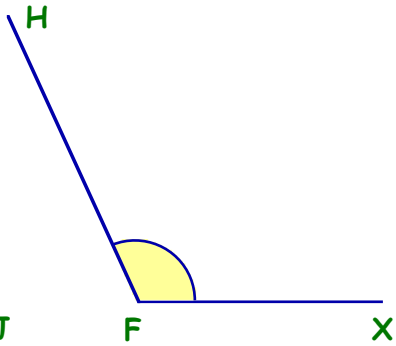
c



4. **d**



e



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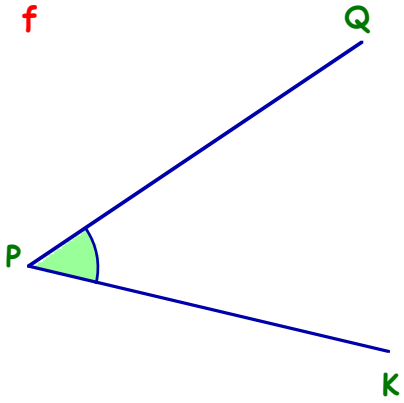
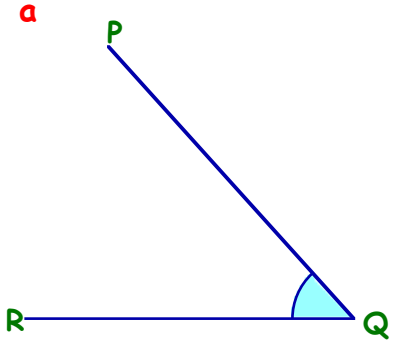


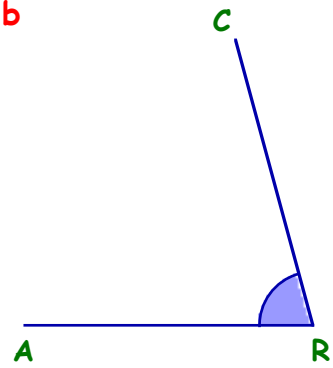
5. These are harder. (*You need to be careful which scale you use*).

Name each angle, measure its size and write it down.

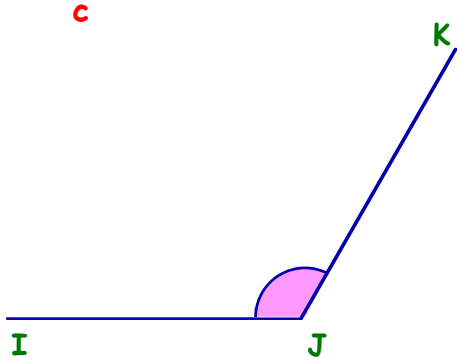
a



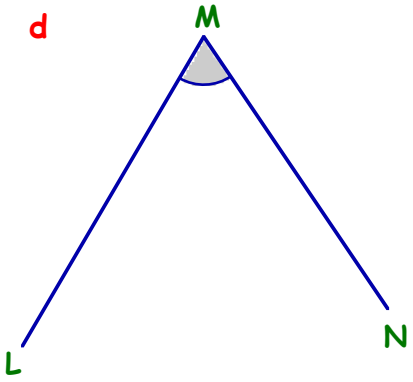
b



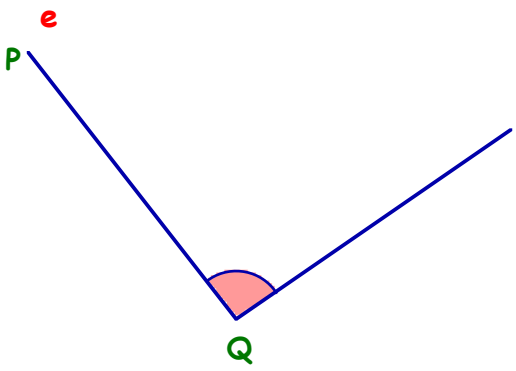
c



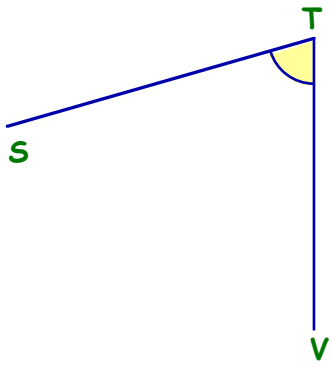
d



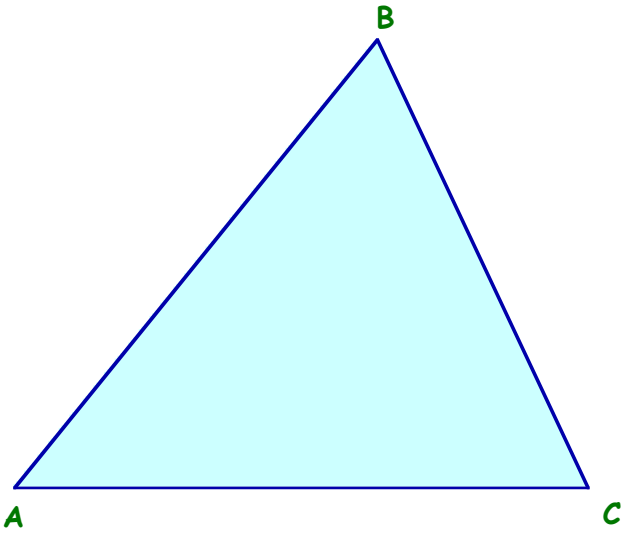
e



f



6.



Look at ΔABC.

a Measure $\angle BAC$. Write it down.

b Measure $\angle BCA$. Write it down.

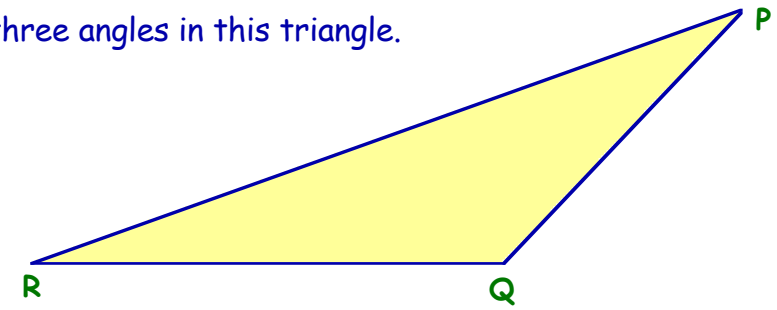
c Measure $\angle ABC$. Write it down.

7. Name and then measure the three angles in this triangle.

a ∠PQR = ? °

b ∠..... = ? °

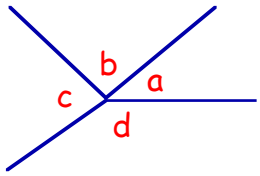
c ∠..... = ? °



Calculating Missing Angles

Exercise 4

1. Shown are 4 angles which fit around a point.

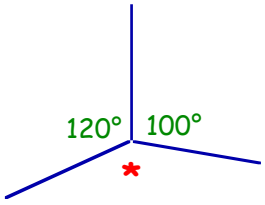


a What answer will you get if you add all 4 angles ?
(i.e. a + b + c + d = ?)

b In general, what answer will you **always** get when you add together all the angles round a point ?

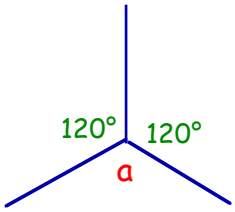
2. **a** What do you get when you add 120° + 100° ?

b Calculate the size of the 3rd angle (*).

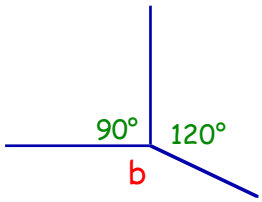


3. Calculate the value of the angles marked a, b, c, ...

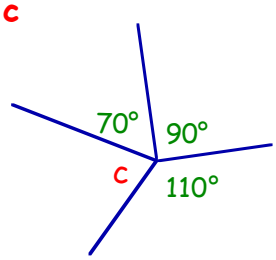
a



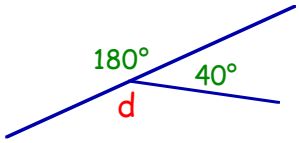
b



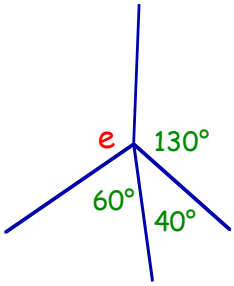
c



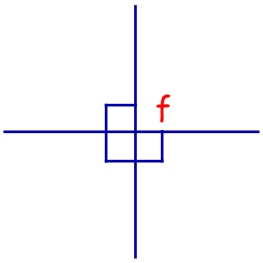
d



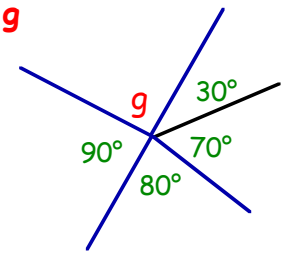
e



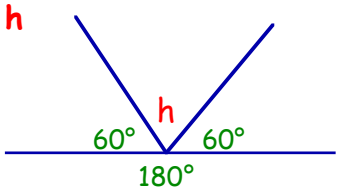
f



g



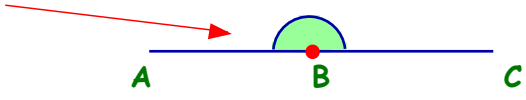
h



4. A **full** revolution is 360°.

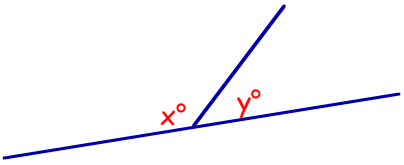
a What is $\frac{1}{2}$ a revolution ?

b What is the size of this angle in degrees ?



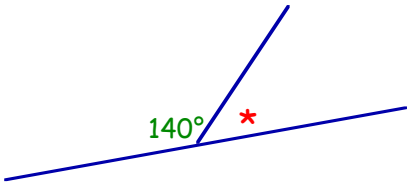
5. 2 angles make up a straight line.

What must the value of $(x + y)$ be ?



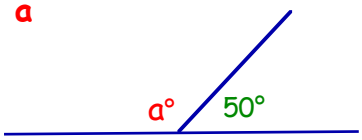
6. In this question, one of the angles is 140°.

Calculate the size of the other angle (*).

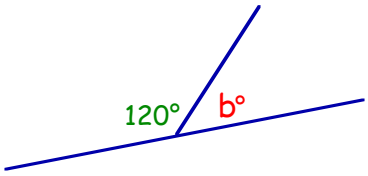


7. Calculate the size of the angles marked a, b, c, … .

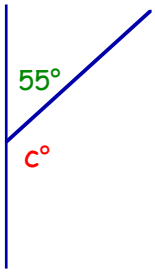
a



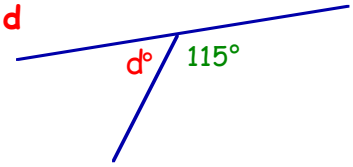
b



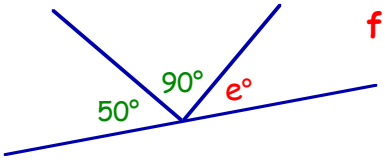
c



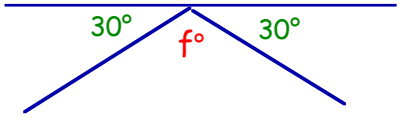
d



e

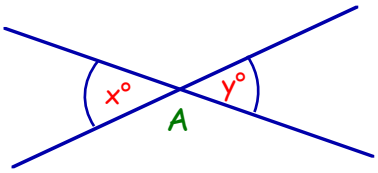


f

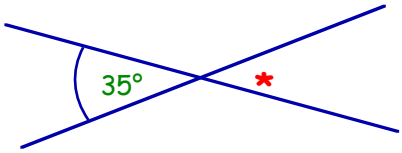


8. Look at the 2 lines crossing over at point A.

What do you think is **always** true about the angles marked x and y ?



9.

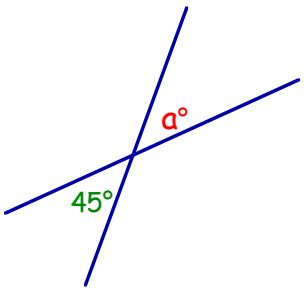


In this figure, one angle is 35°.

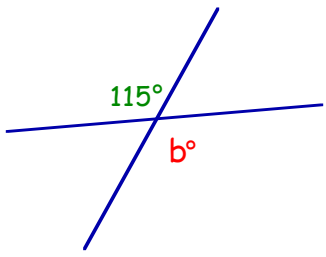
What is the value of the angle marked (*) ?

10. Calculate and write down the sizes of the angles marked a, b, c, … .

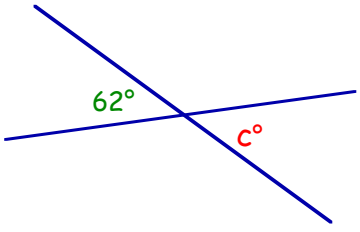
a



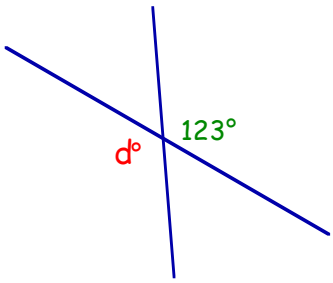
b



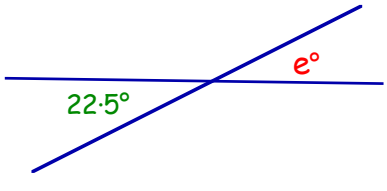
c



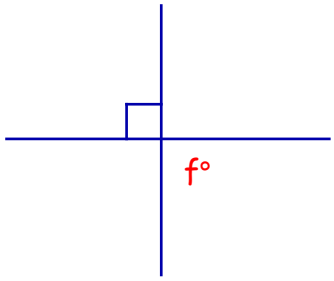
d



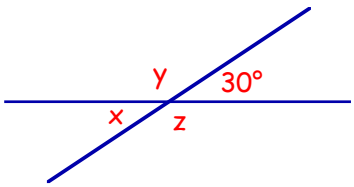
e



f



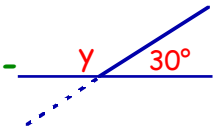
11. In this figure, one angle is 30°.



a Write down the value of x.

b Calculate the value of y.

Remember :-



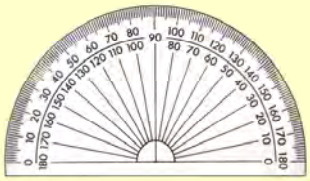
c Now write down the value of z.

Drawing Angles

Take your time.

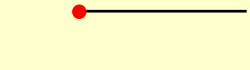
Draw the angle neatly.

Put the letters in at the correct points.

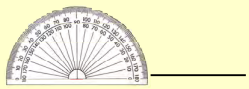


To draw ∠ABC = 37°

Step 1 —> Start with a line with a dot at the end.

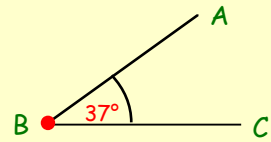


Step 2 —> Put the crossbar of the protractor on the dot and line up with line.



Step 3 —> Count round from the zero line to the 37° mark and put in a dot.

Step 4 —> Join the dots and put in the letters (middle letter **B**).



Exercise 5

1. Draw a 6 centimetre line and put a dot on the end (left side).

Use your protractor to show ∠AFG = 20°.

2. Use the same method to draw and name these angles :-

a ∠PQR = 30° **b** ∠MTZ = 70° **c** ∠IJK = 45° **d** ∠ETC = 15°

e ∠ART = 95° **f** ∠ZWV = 110° **g** ∠DVT = 170° **h** ∠HYQ = 132°.

3. Shown is a small sketch of ΔABC.

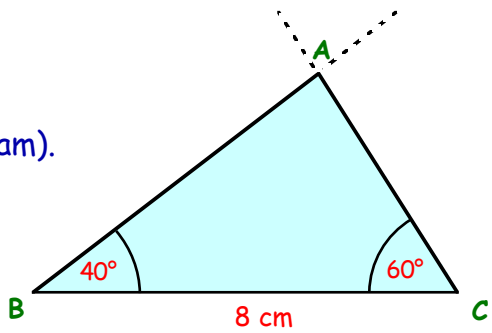
To draw it accurately :-

a Draw the line BC = 8 cm. (Put B and C on your diagram).

b Put your protractor at B and draw an angle of 40°.

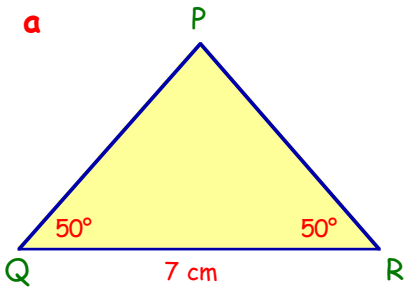
c Put your protractor at C and draw an angle of 60°.

d Where the lines cross, call this point A.

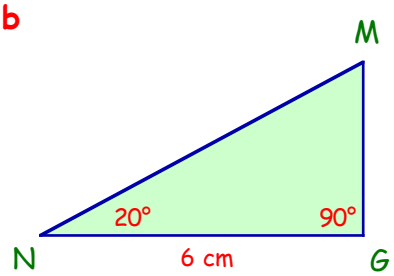


4. Try making full size accurate drawings of these triangles :-

a



b



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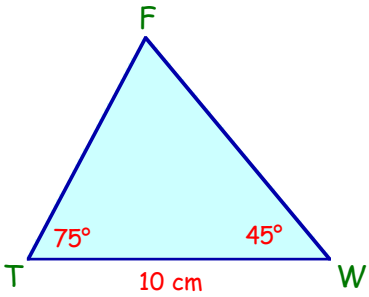


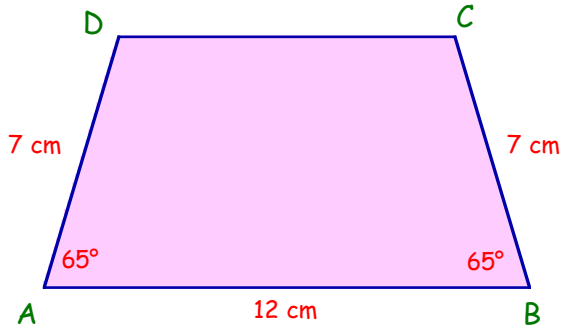
5. To draw this shape :-

a Draw the line AB = 12 cm.

b Put your protractor at A and draw ∠DAB = 65° (Make sure DA = 7 cm).

c Put your protractor at B and draw ∠CBA = 65° (Make sure CB = 7 cm).

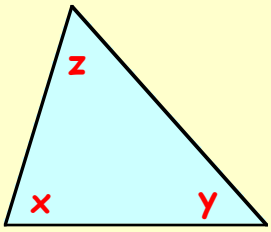
d Join D to C.



Angles in a Triangle

It is a well known fact in maths that no matter how big a triangle is, if you add all 3 angles together you always get 180°.

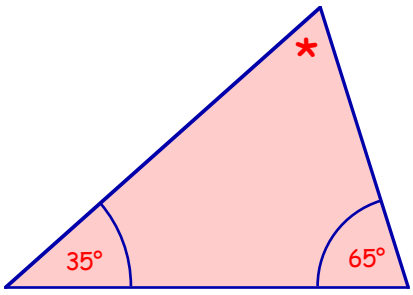
=> **x + y + z = 180°**



Exercise 6

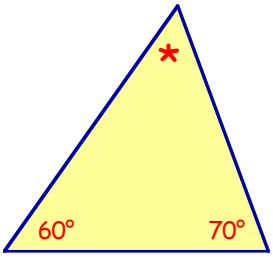
1. **a** In this triangle, what is the value of 35° + 65° ?

b If all 3 angles add to 180°, what must the third angle be (marked *) ?



2. In each of these triangles, add the 2 given angles together, then calculate the size of the 3rd angle.

a



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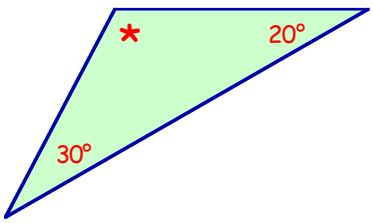

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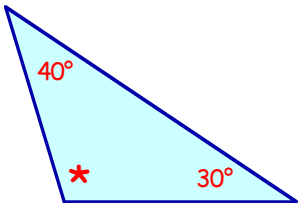

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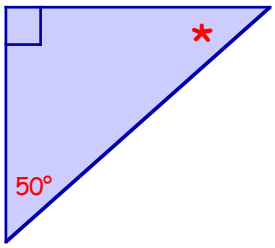
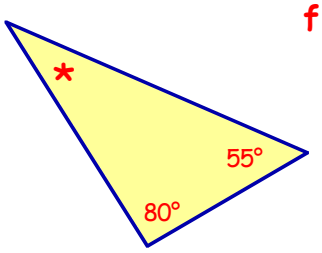


2. **e**



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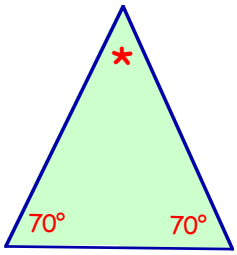

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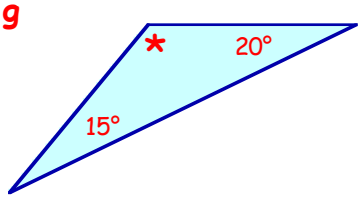

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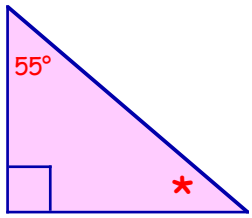
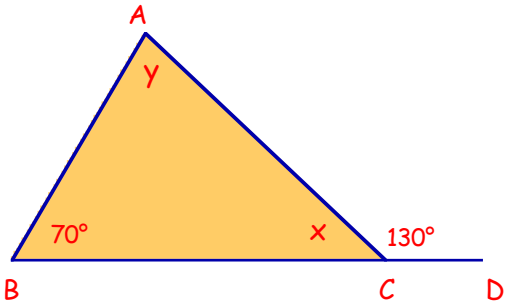
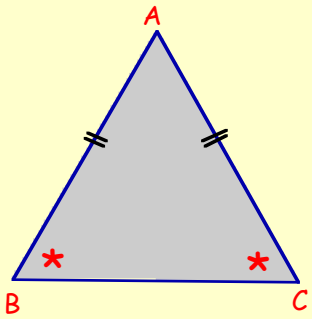


3. **a** Use the 130° to help you calculate the size of the angle marked x.

b Now use ΔABC to help you find the value of y.



4.



Can you remember the special name for this type of triangle ?

The 2 sides (AB = AC) are equal.

The 2 angles (∠ABC = ∠ACB) are equal.

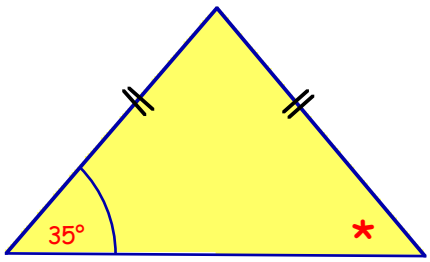
It is called an **ISOSCELES** triangle.

Look at the word, cover it up and try to spell it.

5. An isosceles triangle has 2 angles of the same size.

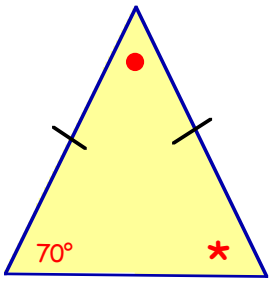
a Write down the value of the angle marked *. (*Don't measure it*).

b Now calculate the size of the 3rd angle.



6. Calculate the sizes of the two missing angles in each triangle :-

a



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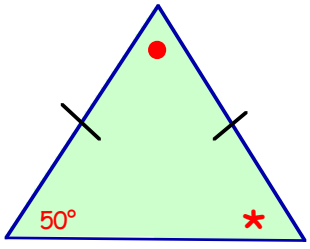
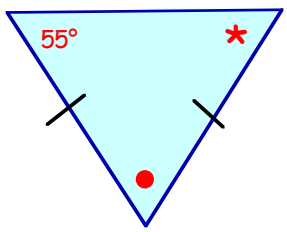


c



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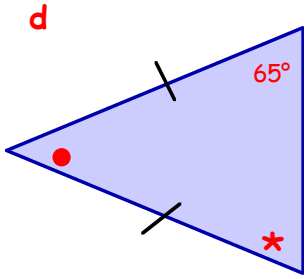

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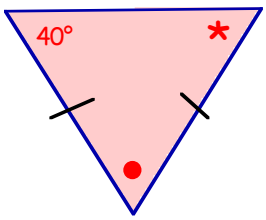

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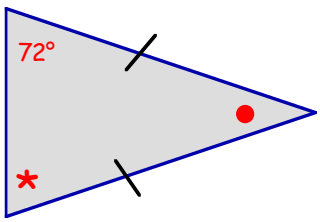

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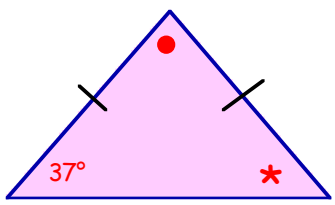

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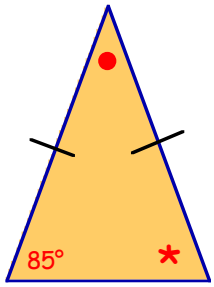
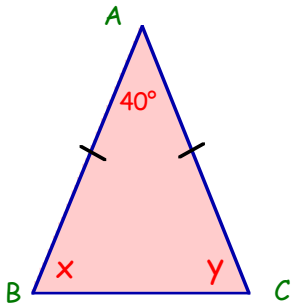


7. ΔABC is isosceles.

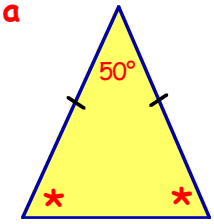


a If $\angle BAC = 40°$, what is the value of $(x + y)$?

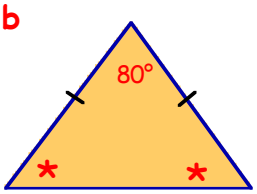
b Since x and y are both the same, what must x and y be ?

8. Calculate the sizes of the two missing angles in each triangle :-

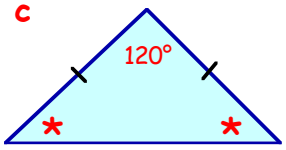
a



b



c



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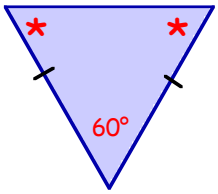

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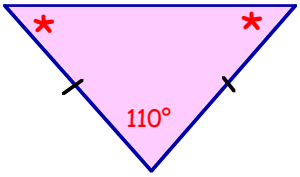

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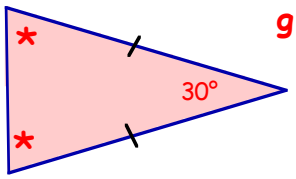

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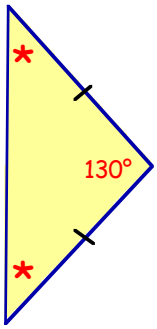

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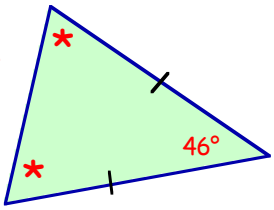
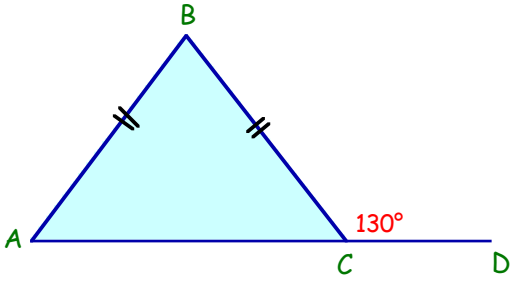


9. ΔABC is isosceles and $\angle BCD = 130°$.

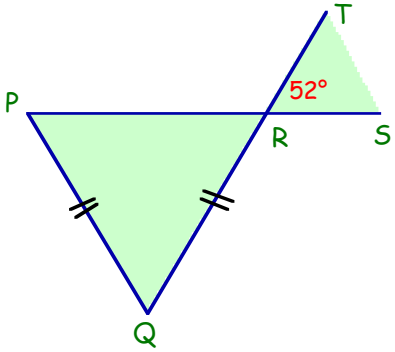


a Calculate the size of $\angle BCA$.

b Calculate the size of $\angle BAC$.

c Now calculate the size of $\angle ABC$.

10.



ΔPQR is isosceles. PQ = RQ and $\angle TRS = 52°$.

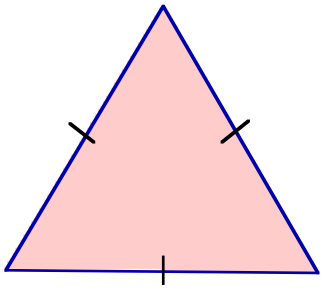
a Calculate the size of $\angle PRQ$.

b Now calculate the size of $\angle RPQ$.

c Finally, what is the size of $\angle PQR$?

11. This is a very special triangle.

All 3 of its sides are the same length.

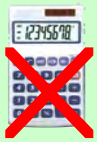


a What do we call this type of triangle ?

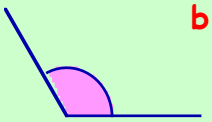
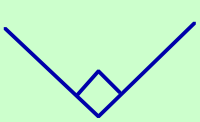
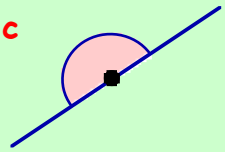
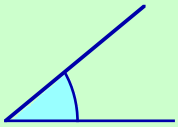
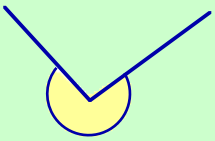
All 3 angles are the same size.

b Calculate the size of each of the 3 angles in this triangle.

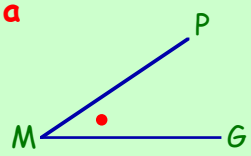
What Have I Learned ?

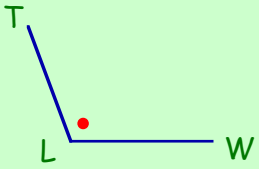


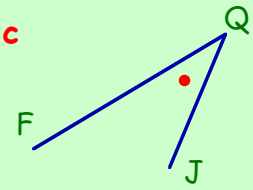
1. What kind of angle is each of these (acute, etc, ...) ?

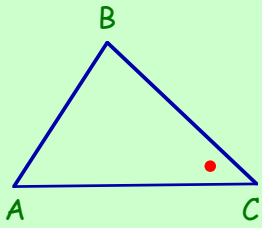
a  **b**  **c**  **d**  **e** 

2. Use 3 letters to name each of the angles marked •.

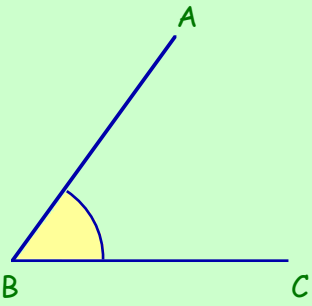
a 

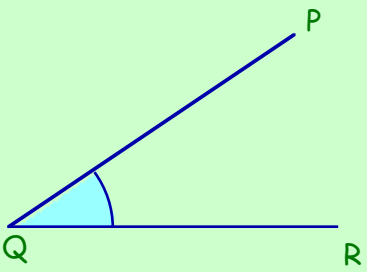
b 

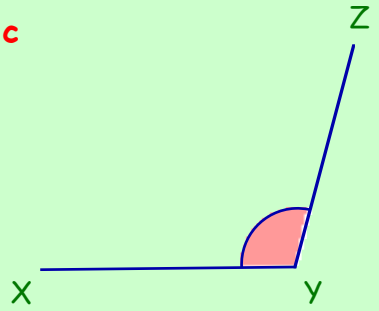
c 

d 

3. Measure these 3 angles [*Guess their sizes (roughly) first*].

a 

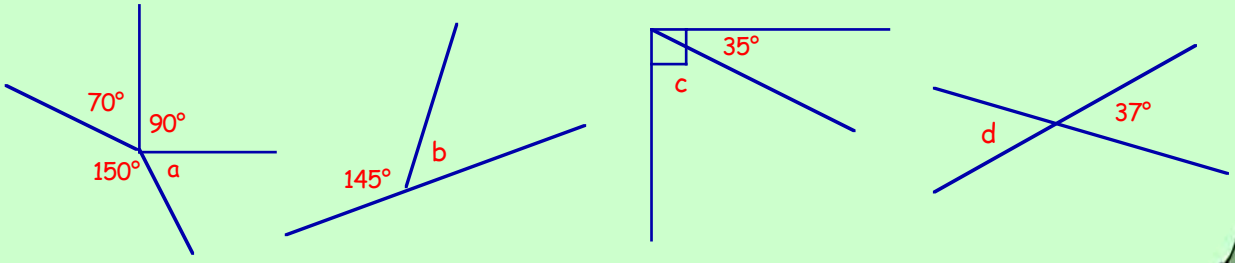
b 

c 

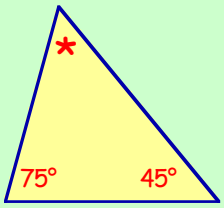
4. **a** Draw a line DE = 6 cm. Use your protractor to show ∠CDE = 65°.

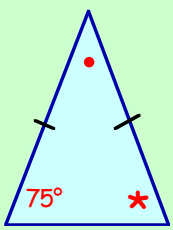
b Draw a line ST = 8 cm. Use your protractor to show ∠RST = 110°.

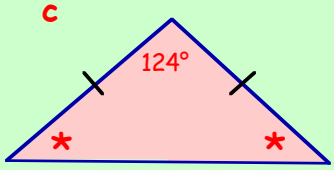
5. Calculate the sizes of the angles marked a, b, c, ... (*Do **not** use a protractor*) .

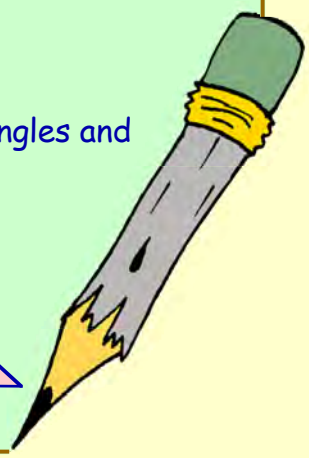


6. Sketch each triangle (neatly). Calculate the sizes of the missing angles and write them in your sketch.

a 

b 

c 

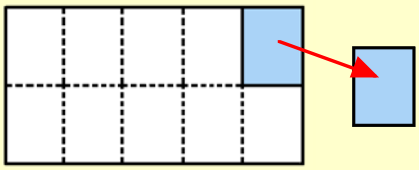


CHAPTER 3

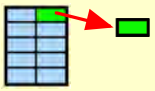
Decimals 1

What are Decimals ?

Tenths and **Hundredths**



= $\frac{1}{10}$ (of 1 bar) or **0·1**

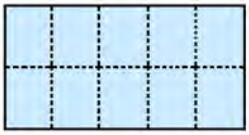


= $\frac{1}{10}$ of $\frac{1}{10}$ of 1 bar

= $\frac{1}{100}$ of 1 bar = **0·01**

1 (large) bar of chocolate

Exercise 1

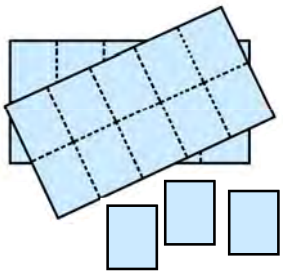
1. If  stands for the number **1**, what numbers are represented here ?

a

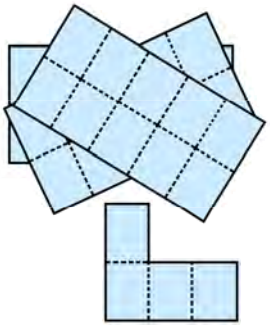
b

c

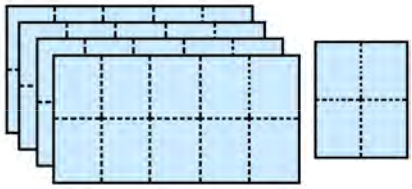
d



e



f



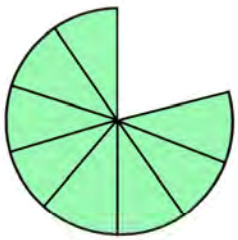
2. Draw neat pictures, similar to those above, to show the numbers :-

a 0·7 **b** 1·1 **c** 1·5 **d** 2·9.

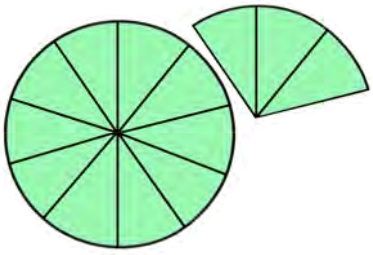
3. These diagrams show pizzas (divided into 10 sections).

What decimal number does each picture represent ?

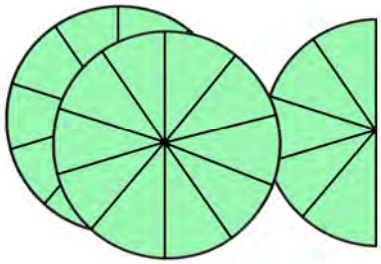
a



b

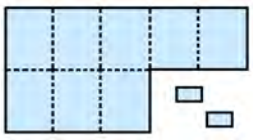


c



4. Given  = **1** bar  = **0·1** bar and  = **0·01** bar,

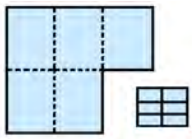
what numbers are represented by these pictures ?

a 

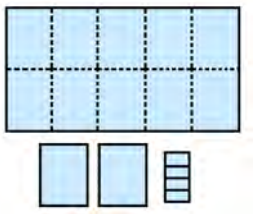
0·8....

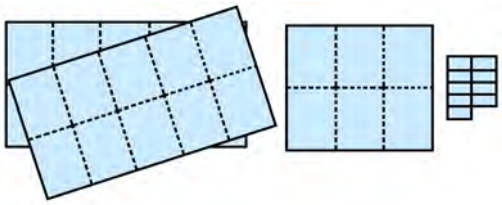
b 

0· .....

c 

0· .....

d 

e 

f 

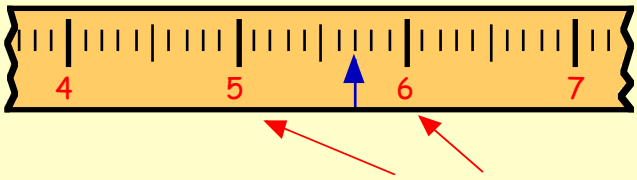
5. Use a ruler to draw neat pictures, similar to those above, to show the numbers :-

a 0·24 **b** 1·35 **c** 2·8.

Reading Decimal Scales

One Decimal Place

To say which division an arrow points to, decide first of all which 2 whole numbers it lies between.



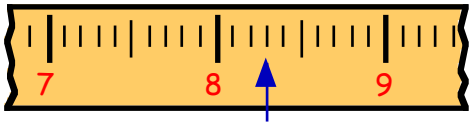
This arrow lies between **5** and **6**.

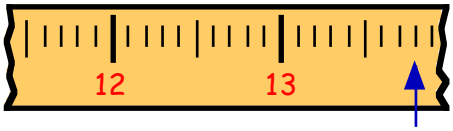
It must be **5·** (something).

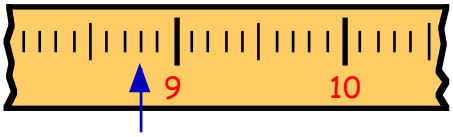
It is in fact **5·7** (can you see this ?).

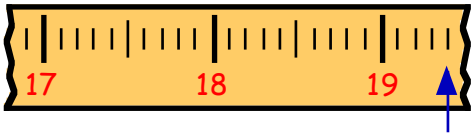
Exercise 2

1. Say what number each of these arrows is pointing to :-

a 

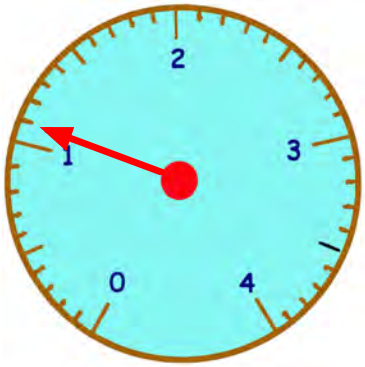
b 

c 

d 

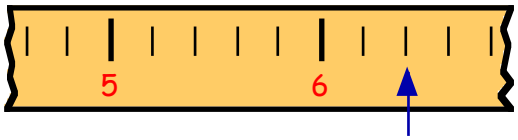
1. **e**

f

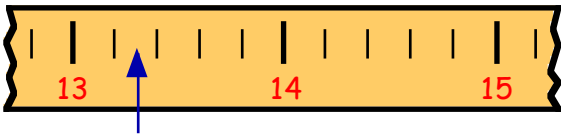


2. **Be careful here.** Say what number each of these arrows is pointing to :-

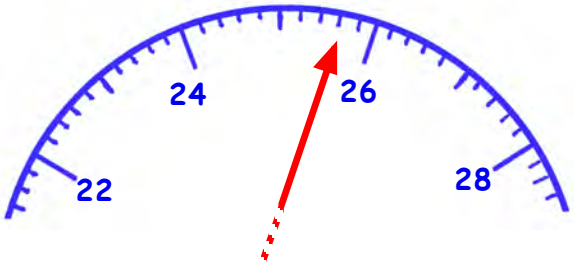
a



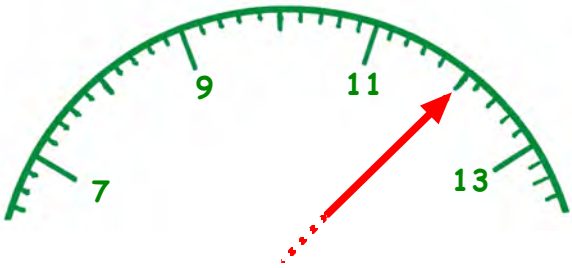
b



c

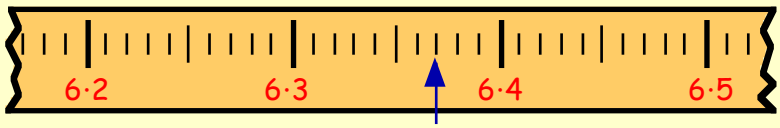


d



2 Decimal Places *(Harder)*

Always look at the 2 readings either side of the arrow. (*The 6·3 and 6·4*).



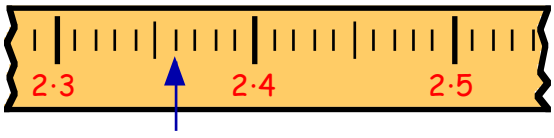
This arrow points to between 6·3 and 6·4

It must be 6·3.... (6·3 something)

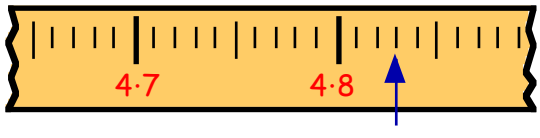
It points to **6 · 37** (*can you see this ?*)

3. Say what number each of these arrows is pointing to :-

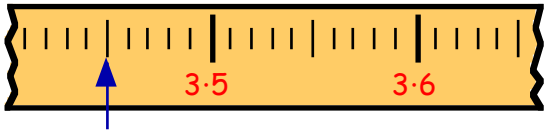
a



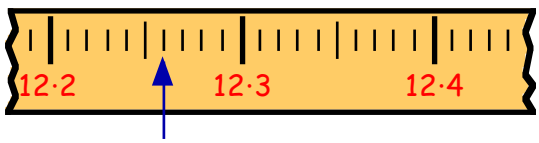
b



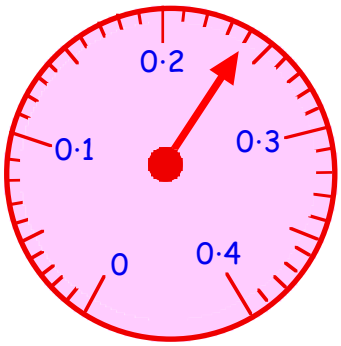
c



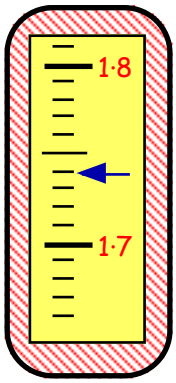
d



3. e

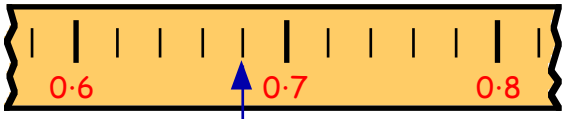


f



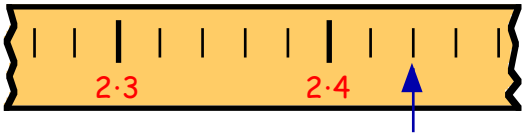
4. **Be careful here.** Say what number each of these arrows is pointing to :-

a

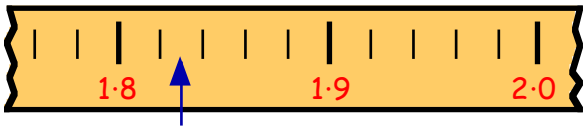


not (0·64 or 0·69)

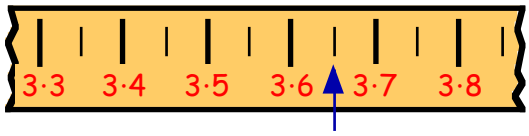
b



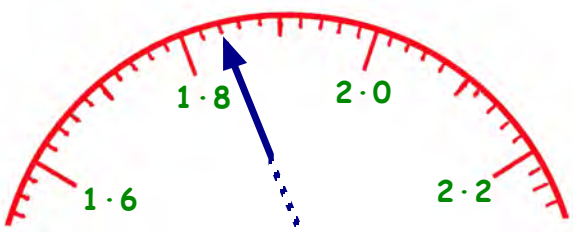
c



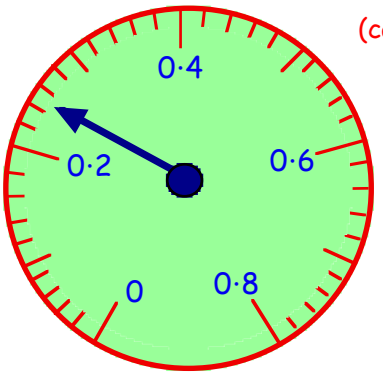
d



e



f (careful)



Rounding to 1 or 2 Decimal Places

Example 1 :- **3·174** lies between 3·17 and 3·18 It is closer to **3·17**, (to 2 decimal places)

Example 2 :- **11·647** lies between 11·64 and 11·65 It is closer to **11·65**, (to 2 decimal places)

Exercise 3

1. Copy and complete these statements :-

a	6·247 lies between 6·24 and 6·2... .	It is closer to ...
b	4·832 lies between 4·83 and ...	It is closer to ...
c	2·719 lies between ... and ...	It is closer to ...
d	1·653 lies between ... and ...	It is closer to ...
e	10·208 lies between ... and ...	It is closer to ...
f	0·582 lies between ... and ...	It is closer to ...
g	6·897 lies between ... and ...	It is closer to ...
h	0·028 lies between ... and ...	It is closer to ...

2. Which of the two numbers in the brackets is the correct answer when the number is rounded to 2 decimal places :-

a	5·326	(5·32 or 5·33)	**b**	8·261	(8·26 or 8·27)
c	1·939	(1·93 or 1·94)	**d**	0·682	(0·68 or 0·69)
e	12·277	(12·27 or 12·28)	**f**	3·006	(3·00 or 3·01)
g	1·696	(1·69 or 1·70)	**h**	0·043	(0·04 or 0·05) ?

To round "**longer**" numbers like **3·74812** to 2 decimal places :-

Step 1 - note that it lies between 3·74 and 3·75

Step 2 - say which number it is closer to —> **3·75**

3. Round these numbers to 2 decimal places, using this method :-

a	2·35417 —> 2·35	**b**	1·86773 —>	**c**	8·21683 —>
d	7·28499 —>	**e**	9·32581 —>	**f**	4·03707 —>
g	5·86333 —>	**h**	6·05137 —>	**i**	3·89681 —>
j	0·24567 —>	**k**	10·1037 —>	**l**	0·06989 —>

4. Use your calculator to do these divisions and write down the answers.

Now round your answer to 2 decimal places :-

a	70 ÷ 13	**b**	200 ÷ 27	**c**	63·8 ÷ 23·7
d	9·3 ÷ 0·78	**e**	123 ÷ 47·9	**f**	29·7 ÷ 35
g	0·98 ÷ 0·47	**h**	385 ÷ 129	**i**	1000 ÷ 345·6.

To change a fraction to a decimal :-

$\frac{7}{19}$ means 7 ÷ 19 = 0·368421..... = **0·37** (to 2 decimal places)

5. Change these fractions to decimals and round the answers to 2 decimal places :-

a $\frac{5}{13}$ = (5 ÷ 13) = **0·38**4615.... = **0·**..... (to 2 decimal places)

b $\frac{7}{11}$ = (7 ÷ 11) = 0·

c $\frac{6}{23}$ = (6 ÷ ...) =

d $\frac{5}{7}$ =

e $\frac{7}{16}$ =

f $\frac{2}{3}$ =

g $\frac{13}{17}$ =

6.

a 3 men have a meal. The total bill is £19·67.
They share the bill equally. (£19·67 ÷ 3).
How much should each man pay ?
(*to the nearest 1 pence*).

b 6 sacks of potatoes weigh a total of 125 kilograms.
If each weighs the same, what is the weight of 1 sack ?
(*to 2 decimal places*).

c

A gardener was paid £52 for planting some shrubs.
It took him 7 hours.
How much was he paid each hour ?

d Which of these fractions is the **biggest** and which is the **smallest** :-

$\{\frac{9}{13}, \frac{7}{9}, \frac{12}{17}\}$?

Hint :- find $\frac{9}{13} = 9 \div 13 =$ ..... find $\frac{7}{9} = 7 \div 9$ ..... find $\frac{12}{17} =$ .....
Now compare your answers.

Add and Subtract Decimal Numbers

Example 1 :-

19·33 + 8·89

=> 19·33
+ 8·89
= **28·22**

line up

Example 2 :-

35·37 – 19·45

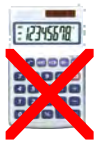
=> 35·37
– 19·45
= **15·92**

line up

Make sure the decimal points are always beneath each other.

Exercise 4

1. Set these down and find the answers :-



a 17·61
+ 8·93

b 35·77
+ 19·26

c 45·69
+ 9·88

d 23·45 + 9·78

e 47·68 + 29·79

f 37·64 + 8·27.

1. **g** 18·73 − 6·58 = _____

h 32·49 − 15·73 = _____

i 64·81 − 27·22 = _____

j 14·26 − 8·71 **k** 65·04 − 28·61 **l** 49·52 − 12·3.

To find 36·8 − 14·62 = _____ rewrite it as (Adding 0's often helps).

7 1
36·80 − 14·62 = 22·18 ← note

2. Find the following :-

a 27·5 − 8·36 = _____

b 42·9 − 13·65 = _____

c 21·6 − 8·39 = _____

d 24·7 − 6·38 **e** 46·4 − 13·73 **f** 9·4 − 7·88.

To find 38 − 17·36 = _____ rewrite it as (Adding 0's often helps).

38·00 − 17·36 = 20·64 ← note

3. Find the following :-

a 19 − 7·23 **b** 8 − 6·92 **c** 13 − 2·08

d 23 − 13·15 **e** 53 − 29·48 **f** 20 − 0·72.

4. **a** From a piece of rope 8·73 metres long, a piece 2·49 metres is cut off. What is the length of the remaining piece ?

b 2 bowls contain apples. One weighs 5·86 kg and the other weighs 4·95 kg.

(i) What is the **total** weight of the 2 bowls ?

(ii) By how much is the bigger bowl heavier than the smaller one ?

Multiplying Decimals

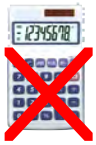
To find **6·47 x 8**

$$\begin{array}{r} 6{\cdot}47 \\ \times\ 8 \\ \hline 51{\cdot}76 \\ \hline \end{array}$$

remember the point

It helps to copy the decimal point straight down from where it is.

Exercise 5



1. Copy these and find the answers :-

a 4·23 x 6

b 2·94 x 5

c 5·06 x 8

d 8·17 x 7

e 12·24 x 3

f 0·81 x 9

g 16·73 x 4

h 37·86 x 2

i 5·27 x 9

j 16·83 x 5

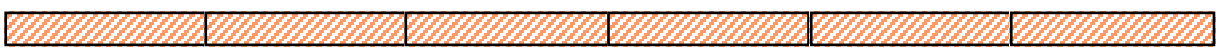
k 9·27 x 6

l 8 x 1·35.

2. **a** A tyre weighs 5·73 kilograms.
What will 4 tyres weigh ?

b A plank is 3·85 metres long.

If 6 planks are joined end to end, what will the total length be ?



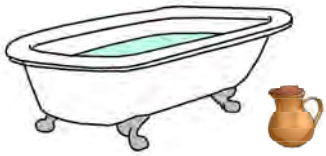
c

A Garden Centre sells hanging baskets for £8·97.
If I bought 9 baskets, how much did this cost ?

2. d A jug holds 3·67 litres of water when full.

8 full jugs of hot water are poured into an empty bath.

How much water is in the bath ?



e

Twin boys, Ian and Greg, each weigh 47·63 kg.

What is the combined weight of the 2 boys ?

f The distance between the banks of a river is 32·65 metres.

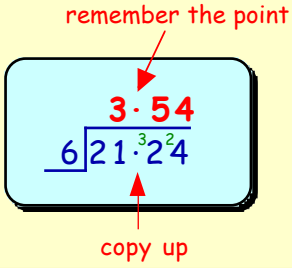
How far will Nick have travelled if he swam from bank to bank 3 times each way ?

Division by Decimals

Remember to copy the decimal point up to the line above.

To find :- **21·24 ÷ 6**

=>



Exercise 6

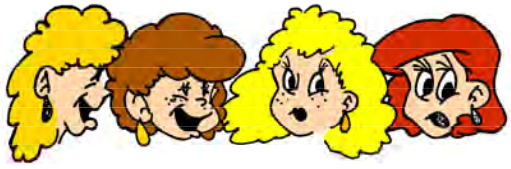
Again – Knowing your tables **really** helps here.

1. Copy and do the following :-

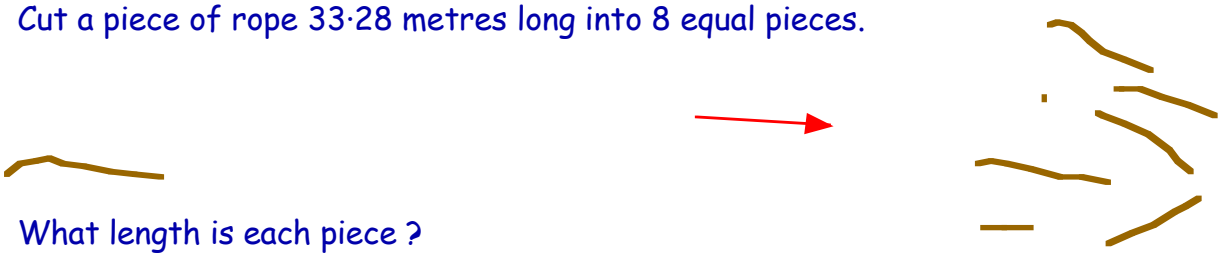
a	$2\overline{)16{\cdot}48}$	**b**	$3\overline{)16{\cdot}65}$	**c**	$4\overline{)23{\cdot}56}$
d	$5\overline{)23{\cdot}85}$	**e**	$6\overline{)49{\cdot}50}$	**f**	$7\overline{)38{\cdot}01}$
g	$8\overline{)50{\cdot}56}$	**h**	$9\overline{)30{\cdot}78}$	**i**	$6\overline{)4{\cdot}32}$
j	43·25 ÷ 5	**k**	21·84 ÷ 8	**l**	13·37 ÷ 7.

2. a Share £58·16 equally amongst 4 women.

How much will each receive ?



b Cut a piece of rope 33·28 metres long into 8 equal pieces.



What length is each piece ?

2. **c** 6 identical bunches of grapes weigh 14·04 kg in total.

What is the weight of 1 bunch ?

d

3·45 litres of juice is poured equally into 5 glasses.

How much juice will there be in each glass ?

e A runner completes 4 circuits of a race in a total time of 172·48 seconds.

What was his average time for each circuit ?

f

7 new waste bins are delivered to the Waldorf Hotel.

The total weight of the bins is 26·18 kilograms.

(i) What is the weight of 1 bin ?

(ii) Now calculate the weight of 3 bins.

Multiplication by 10, 100, 1000 - (Rules, Rules, Rules !!)

Can you remember when you multiplied a whole number by 10 you simply added a **0** on to the end ?

36 x 10 = 360

This rule does **not** work for decimals.

To find **3·81 x 10**

=> 3 · 8 1 x 10 = 3 8 · 1

move all the figures **1 place left**

To find **1·372 x 100**

=> 1 · 3 7 2 x 100 = 1 3 7 · 2

move all the figures **2 places left**

Exercise 7

1. Copy these down and find the following :-

a 6·34 x 10 = _____

b 4·17 x 10 = _____

c 0·78 x 10 = _____

d 12·34 x 10 = _____

e 5·9 x 10 = _____

f 0·6 x 10 = _____

g 1·234 x 100 = _____

h 0·878 x 100 = _____

i 6·39 x 100 = _____

j 11·487 x 100 = _____

k 0·021 x 100 = _____

l 4·5 x 100 = _____

Simple Rules :-

To multiply by 10 => move the **figures 1 place to the left.**
=> (or move **the point 1 place to the right.**)

2. **Write down** the answers to the following by using the rule above :-

a 10 x 8·21 **b** 10 x 1·37 **c** 10 x 0·93 **d** 10 x 6·2

e 14·15 x 10 **f** 28·7 x 10 **g** 0·04 x 10 **h** 10 x 1·05.

3. **Write down** the answers to the following by using the rule above :-

a 6·31 x 100 **b** 100 x 2·47 **c** 1·358 x 100 **d** 0·927 x 100

e 100 x 14·16 **f** 1·037 x 100 **g** 0·002 x 100 **h** 100 x 2·5.

4. A drawing pin weighs 0·27 grams.

Calculate the weight of :-

a 10 pins **b** 100 pins ?

5. A bottle holds 1·75 litres of water.

How many litres are there in :-

a 10 bottles **b** 100 bottles ?

6. Extend the above rules to help find the answers to the following :-

a 2·134 x 1000 **b** 0·376 x 1000 **c** 15·18 x 1000

d 0·00361 x 1000 **e** 1000 x 0·001 **f** 0·0303 x 1000.

Division by 10, 100, 1000 - (Yet More Rules !!)

We have just given a rule that said :-

To Multiply by 10
Move all the figures
1 place to the left

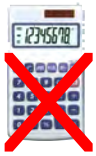
=> Now =>

To Divide by 10
Move all the figures
1 place to the right

$16 \cdot 3 \div 10$ =>

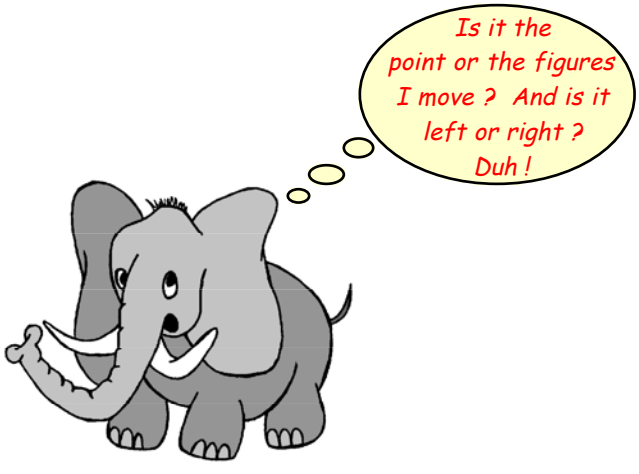
$10 \overline{)16 \cdot 3} = 1 \cdot 63$

Exercise 8



1. Copy and find the following :-

a	$10 \overline{)6 \cdot 4}$	b	$10 \overline{)19 \cdot 4}$	c	$10 \overline{)3 \cdot 21}$
d	$10 \overline{)0 \cdot 65}$	e	$10 \overline{)68}$	f	$10 \overline{)0 \cdot 03}$
g	$14 \cdot 7 \div 10$	h	$22 \cdot 63 \div 10$	i	$9 \div 10$
j	$100 \overline{)23 \cdot 1}$	k	$100 \overline{)289}$	l	$100 \overline{)1231}$
m	$48 \cdot 3 \div 100$	n	$29 \cdot 81 \div 100$	o	$6 \cdot 7 \div 100$
p	$\frac{9 \cdot 8}{10}$	q	$\frac{27}{10}$	r	$\frac{0 \cdot 65}{10}$
s	$\frac{53 \cdot 1}{100}$	t	$\frac{165}{100}$	u	$\frac{3 \cdot 7}{100}$.



The rule for dividing by 10 is simple.

To divide a number by 10, simply move all the figures 1 place to the right.

2. **a** Write down a similar rule for **dividing by 100**.

b Now write down the rule for **dividing by 1000**.

3. Find the following :-

a $1000\overline{)265{\cdot}3}$ **b** $1000\overline{)3625}$ **c** $1000\overline{)58{\cdot}1}$

d $293{\cdot}1 \div 1000$ **e** $62 \div 1000$ **f** $5870 \div 1000$

g $\frac{480}{1000}$ **h** $\frac{18625}{1000}$ **i** $\frac{61{\cdot}3}{1000}$.

4. **a** If 10 packets of crisps cost £2·30, what will one packet cost ?

b If a box of 100 chocolate biscuits costs £15, what will one biscuit cost ?

c 1000 bolts weigh 5·85 kg. What will one bolt weigh ?

d 10 planks of wood together measure 95 cm. What is the width of one plank ?

e 100 dice weigh 875 grams. What will one dice weigh ?

To change from millimetres to centimetres, you "**divide by 10**".

5. Change each of the following to centimetres :-

a 18 mm **b** 37 mm **c** 8·9 mm **d** 6·0 mm **e** 0·4 mm.

To change from centimetres to metres, you "**divide by 100**".

Change each of the following to metres :-

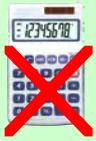
6. **a** 355 cm **b** 602 cm **c** 88 cm **d** 25·3 cm **e** 6·4 cm.

To change from metres to kilometres, you "**divide by 1000**".

7. Change each of the following to kilometres :-

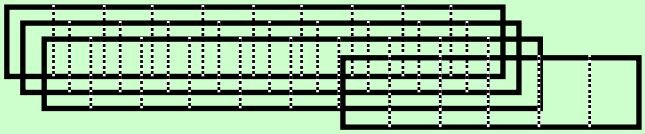
a 32 370 m **b** 965 m **c** 472 m **d** 85·9 m **e** 9·7 m.

What Have I Learned ?



1. 

What number does this stand for ?



2. Use a ruler to **neatly** represent the number 2·8 in the same way as shown above.

3. Round these numbers to **1 decimal place** :-

a 3·16 **b** 15·82 **c** 4·35 **d** 0·92 **e** 6·98.

4. Round these numbers to **2 decimal places** :-

a 6·374 **b** 10·187 **c** 0·966 **d** 3·125 **e** 0·0298.

5. Copy and do the following :-

a $6{\cdot}82 + 1{\cdot}39$ **b** $17{\cdot}81 - 8{\cdot}45$ **c** $23{\cdot}5 + 6{\cdot}28$ **d** $19 - 8{\cdot}51$

e $11{\cdot}4 - 2{\cdot}73$ **f** $0{\cdot}99 + 9{\cdot}9$ **g** $15 - 4{\cdot}2$ **h** $2 - 1{\cdot}01$.

6. Copy and do the following :-

a $6{\cdot}3 \times 4$ **b** $8{\cdot}2 \times 9$ **c** $14{\cdot}5 \times 6$ **d** $0{\cdot}87 \times 8$

e $4\overline{)17{\cdot}2}$ **f** $6\overline{)58{\cdot}2}$ **g** $5\overline{)13{\cdot}75}$ **h** $7\overline{)9{\cdot}38}$.

7. Write down the answers to the following :-

a $3{\cdot}12 \times 10$ **b** $10 \times 0{\cdot}816$ **c** $4{\cdot}27 \times 100$

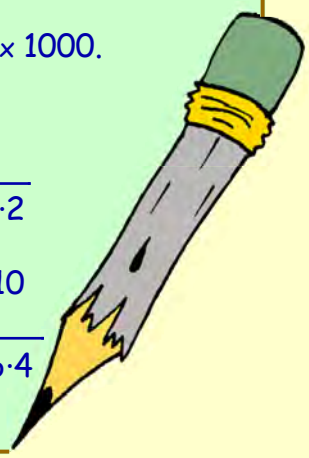
d $0{\cdot}961 \times 100$ **e** $1000 \times 1{\cdot}713$ **f** $0{\cdot}0641 \times 1000$.

8. Write down the answers to the following :-

a $10\overline{)16{\cdot}2}$ **b** $10\overline{)8{\cdot}5}$ **c** $100\overline{)93{\cdot}2}$

d $100\overline{)8{\cdot}65}$ **e** $100\overline{)35}$ **f** $26{\cdot}8 \div 10$

g $2647 \div 1000$ **h** $\frac{378}{1000}$ **i** $1000\overline{)16{\cdot}4}$



CHAPTER 4

Percentages 1

Percentages, Decimals & Fractions

Remember :-

17% means $\frac{17}{100}$ = 0·17 also 3% means $\frac{3}{100}$ = 0·03

Exercise 1

1. Write each of the following as a fraction **AND** as a decimal :-

   a 23% **b** 45% **c** 51% **d** 19% **e** 72%

   f 8% **g** 2% **h** 9% **i** 17·5% **j** 6·5%.

2. (**Knowing your multiplication tables will help here**).

   Write these percentages as fractions and simplify where possible :-

   a 35% = $\frac{35 \div 5}{100 \div 5}$ = $\frac{\quad}{\quad}$ **b** 70% = $\frac{70 \div 10}{100 \div 10}$ = $\frac{\quad}{\quad}$

   c 85% **d** 90% **e** 50% **f** 25% **g** 75%

   h 10% **i** 5% **j** 16% **k** 48% **l** 96%

   m 2% **n** 60% **o** 15% **p** 26% **q** 80%.

To change a fraction (like $\frac{2}{5}$) to a percentage :-

$\frac{2}{5}$ means 2 ÷ 5 = 0·4 (calculator) = (0·4 x 100%) = **40%**

$\frac{3}{4}$ means 3 ÷ 4 = 0·75 (calculator) = (0·75 x 100%) = **75%**

3. Copy the following and use your calculator to change each fraction to a percentage :-

   a $\frac{7}{50}$ = 7 ÷ 50 = 0·..... = (0·..... x 100%) = $\square$ %

   b $\frac{1}{4}$ = 1 ÷ 4 = 0·..... = (0·..... x 100%) = $\square$ %

   c $\frac{4}{25}$ **d** $\frac{4}{5}$ **e** $\frac{7}{10}$ **f** $\frac{13}{20}$ **g** $\frac{1}{2}$ **h** $\frac{1}{10}$

   i $\frac{19}{20}$ **j** $\frac{17}{25}$ **k** $\frac{1}{8}$ **l** $\frac{3}{8}$ **m** $\frac{9}{10}$ **n** $\frac{1}{100}$.

4. David scored $\frac{21}{25}$ in a maths test. To write this as a percentage :-

Score = $\frac{21}{25}$ = 21 ÷ 25 = 0·84 = (0·84 x 100%) = **84%**

Change each of these test scores to percentages in the same way :-

a Suzie scored 27 out of 30 (= $\frac{27}{30}$ = 27 ÷ 30 = 0· ..... = ... %)

b Billy scored 45 out of 50

c Helen scored 24 out of 40

d Ian scored 7 out of 10

e Megan scored 19 out of 25

f Kayleigh scored 42 out of 60

g Lynsey scored 60 out of 80

h Jason scored 27 out of 54.

5. Ryan sat 4 separate tests. Listed below are his marks.

English -	45 out of 60	Science -	16 out of 20
Maths -	21 out of 30	History -	18 out of 25

By changing each score to a **percentage**, write his subjects in order, starting with his best subject.

Percentages using a Calculator

To find 17% of £300 =>

17% of £300 = $\frac{17}{100}$ x 300

= (17 ÷ 100) x 300 = **£51**

To find 6% of £90 =>

6% of £90 = $\frac{6}{100}$ x 90 note*

= (6 ÷ 100) x 90 = **£5·40**

Exercise 2

1. Use your calculator to find the following :-

a 16% of £40 = (16 ÷ 100) x 40 = £.....

b 14% of £70

c 23% of £11

d 32% of £750

1. **e** 53% of £900 **f** 12% of £80 **g** 62% of £4600

h 95% of £8·40 **i** 3% of £9 **j** 1% of £650

k 36% of £7·50 **l** 75% of 60p **m** 44% of £2·50

n 7% of £14 **o** $17\frac{1}{2}$% of £80 **p** $5\frac{1}{2}$% of £50.

(17·5)% (5·5)%

2. **a** Of the 220 pupils in First Year, 45% are boys.

(i) How many boys are there ?

(ii) How many girls are there ?

b A driver used 70% of his full tank of petrol driving to Birmingham.

If his car holds 60 litres, how many litres did he use ?

c A packet of cereal weighs 750 grams.

22% of it is sugar
46% of it is starch
8% of it is protein
9% of it is fibre
5% of it is fat

Calculate how many grams of sugar, starch, protein, fibre and fat are in the packet.

d 90% of the human body is made up of water.

If Tim weighs 65 kilograms, how much of him is water ?

e

I sold my bicycle for 60% of what I paid for it.

I paid £350 for it a year ago.

How much did I receive when I sold my bicycle ?

f I am at school for 25% of the day.

Of the 24 hours in a day, how much of the time do I actually spend at school ?

Percentage Rise

My holiday should have cost me £900 but the price **rose** by 7%. =>

Old Price	£900
Rise (7% of 900) =	£ 63 <- (7 ÷ 100) x 900)
New Price =	**£963**

Exercise 3

(*For each question in this exercise, show the 3 lines of working neatly*).

1. A holiday was priced at £800. It rose by 10%.

What is the new cost of the holiday ?

2. Last year a camcorder cost £280.

This year it rose by 25%.

What is the new cost ?

3. The pressure in a boiler was 80 poundals.

The pressure rose by 15%.

What is the new pressure ?

4. A hot air balloon rose from a height of 1200 feet by 30%.

What was its new height ?

5. When David started Secondary School, his height was 1·40 metres.

By the end of Secondary 4, his height had risen by 20%.

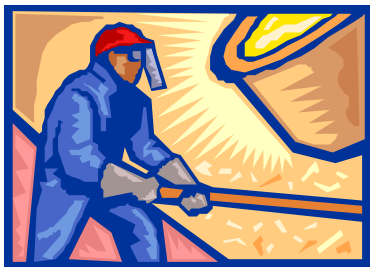
What was David's new height ?

6. Gabby weighed 50 kg, but because of overeating at Christmas and New Year, her weight rose by 8%.

Calculate Gabby's new weight.

7. A ship was sailing at 25 km/hour.
It increased its speed by 40%.
What was its new speed ?

8.



The temperature in a furnace was 600°C.
The temperature rose by 13%.
What was the new temperature ?

9. A boy received £12 pocket money each week.
His dad gave him a rise of 15%.
What was his new pocket money ?

10.

A sums teacher walked a total distance of 30 kilometres one Saturday.
The next day, he calculated he had only walked 24% of Saturday's journey.
How far had he walked altogether ?

11. Nick earned £18 000 last year.
He received a 4% pay rise.
How much did Nick earn this year ?

12. This vintage American car cost £10 500 a year ago.
This year, the price rose by 8%.
How much is it worth this year ?

13.

A balloon held 2400 cubic centimetres of air.
It was inflated by a further 60% before it burst.
What was its volume just as it burst ?

14. A **SURCHARGE** is simply an **increase** in the amount you pay for your holiday.
Thornton's had to "levy" a surcharge of **5%** on all their holidays.

	THORNTON'S HOLIDAYS			
Majorca	8th July	7 days	*h/b*	£360
Ibiza	15th July	14 days	*h/b*	£420
Lanzarote	22nd July	10 days	*room*	£480
Minorca	1st July	14 days	*h/b*	£520
Tenerife	3rd July	7 days	*s/c*	£380

a What will it **now** cost to go to Majorca for 7 days ?

b How much will it **now** cost to fly to Lanzarote for 10 days ?

c Mr McIntosh and his wife booked for 2 weeks in Minorca.

(i) What **should** their bill have come to ?
(*For the two of them*).

(ii) How much "surcharge" did they have to pay ?

(iii) What did their **final** bill come to ?

Percentage Fall

Sometimes prices fall, for example, in a **SALE**.

This C.D. should cost £14 but it is REDUCED by 20% in the January Sales.

3 lines each time =>

Old Price = £14·00

=> **Fall** = $\frac{20}{100}$ x 14 = £ 2·80 (calculator)

=> **New** Price = (£14 – £2·80) = **£11·20**

Exercise 4

(*For each question in this exercise, show the 3 lines of working neatly*).

1. This camera cost £30 last month.
This month, it was reduced by 40% in the sale.
What was its new price ?

2. 

"Two-to-Two" mobile phones cost £80.
The price dropped by 15% in a sale.
What was the new price of a phone ?

3. A Caribbean cruise cost £660 last summer.
This year, the price has dropped by 8%.
What is the new price of the cruise ?

4. 

A plane was flying at 20 000 feet.
Due to a storm, the plane's height dropped by 35%.
What was the new height of the plane ?

5. The temperature during a warm summer's day was 24°C at noon.
By 8 pm, it had dropped by 25% of this temperature.
What was the new temperature ?

6. 

A racing car was doing 140 mph along the straight during a practice lap.
The driver slowed by 40% at a tight bend.
What was the car's speed around the bend ?

7. 

Mrs Higgins weighed in at 70 kilograms.

After dieting and exercising for 3 months, she found she had lost 15% of her original weight.

What was her new weight ?

8. A jug left on the windowsill held 4 litres of water.

Whilst sitting in the sunshine, 15% of the water evaporated.

How much water was left in the jug ?

9. 

8·2 centimetres of snow fell one night.

By noon the following day, 30% had melted.

What was the depth of the remaining snow ?

10. A lady's winter coat cost £200 when new.

When sold in a charity shop, the price dropped by 95%.

What was the price of the coat in the charity shop ?

11. "**SPORTS DELIGHT**" had a winter sale.

They offered "**30% off** all goods".

What would the **sale price** be for :-

a the football

b the pair of trainers

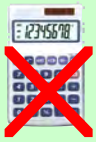
c the dartboard

d the cricket set

e the pair of football boots

f the weights ?

What Have I Learned ?



1. Write 23% as :- **a** a fraction **b** a decimal.

2. Write each of the following as a fraction and simplify as much as possible :-

a 30% **b** 45% **c** 16%.

3. Use your calculator to change each of the following fractions to a :-

(i) decimal **(ii)** percentage :-

a $\frac{13}{20}$ **b** $\frac{11}{25}$ **c** $\frac{27}{40}$.

4. David scored 54 out of 60 in a Maths Test. Write his score as a percentage.

5. Use your calculator to find the following :-

a 37% of £240 **b** 19% of £650

c 8% of £22 **d** $17\frac{1}{2}$% of £840.

6. Lucy saw a trouser suit in Murphys priced at £85.

a How much would she have saved in the Summer Sale ?

b How much would the suit have cost her in the sale ?

7. A basin held 6·4 litres of water.

When a tap was opened, the volume of water in the basin increased by 30%.

How much water was now in the basin ?

8. Tim's 3 test marks in Science were :-

Test 1 - $\frac{15}{20}$ **Test 2** - $\frac{35}{50}$ **Test 3** - $\frac{8}{10}$

Which was his best mark and which was his worst mark ?
(*Show your working and explain*).

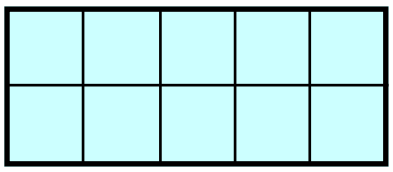
CHAPTER 5

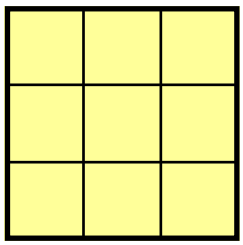
Enlargements

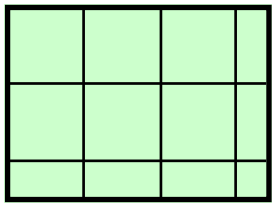
Scale Drawings & Enlargements

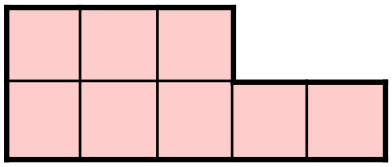
Exercise 1

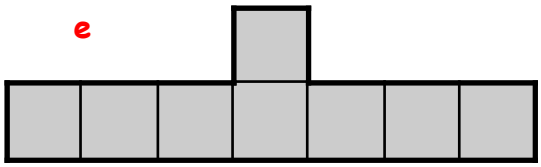
1. Make a neat "**two-times**" enlargement of each of these shapes :- (*Each box = 1 cm*).

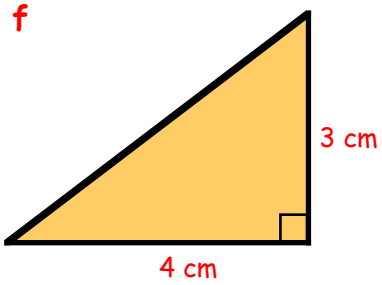
a 

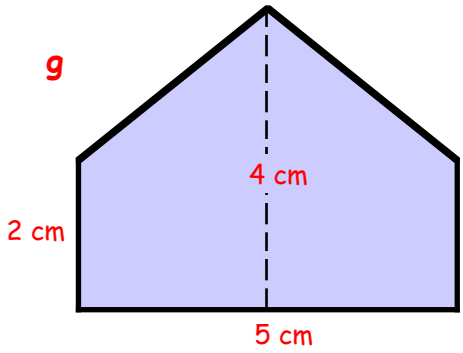
b 

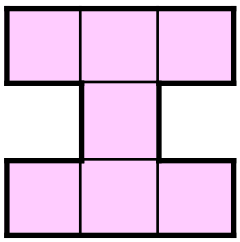
c 

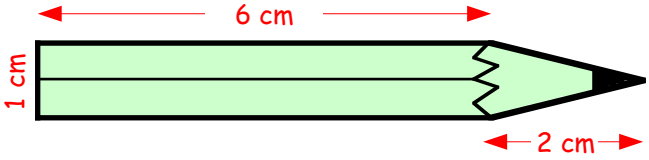
d 

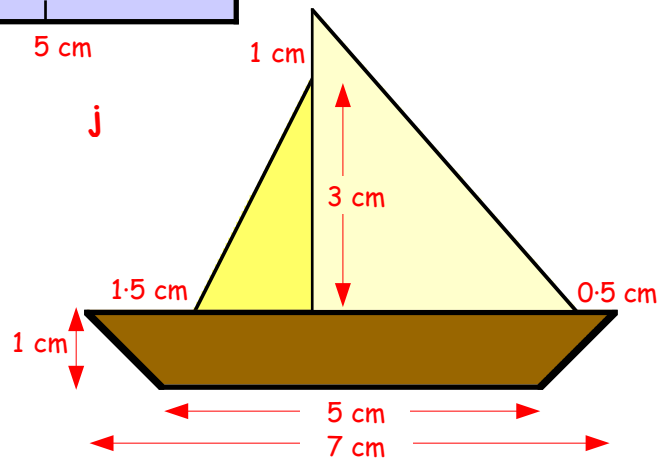
e 

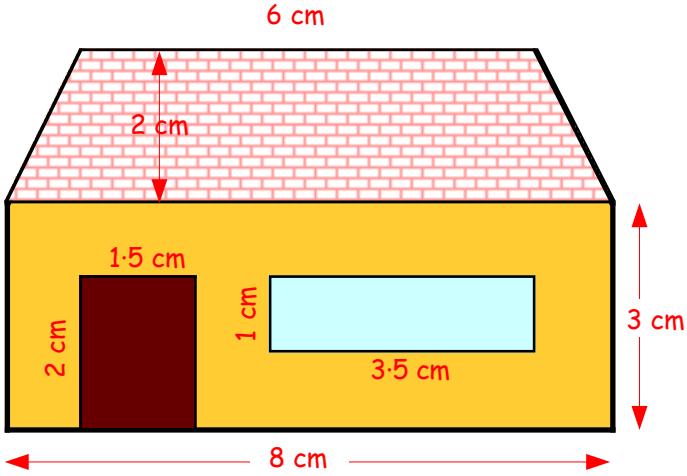
f 

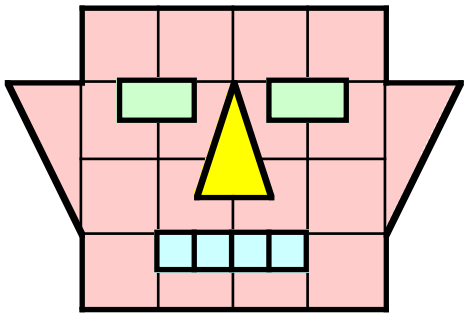
g 

h 

i 

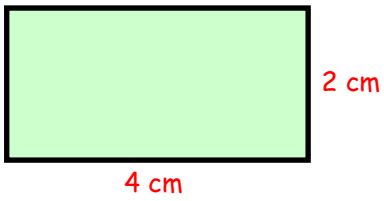
j 

k 

l 

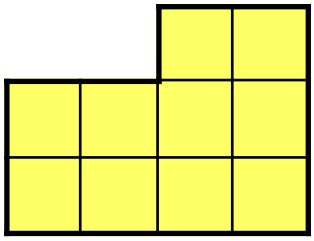
2. Make enlargements of the following, using the given scale :-

a



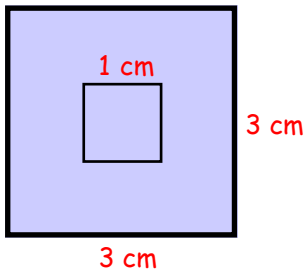
make a **three times** enlargement.

b



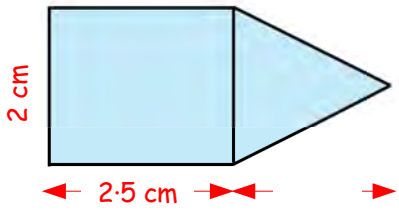
make a **four times** enlargement.

c



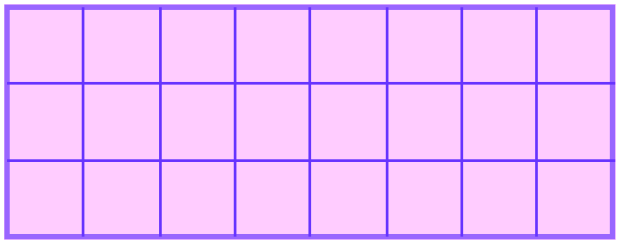
make a **three times** enlargement.

d



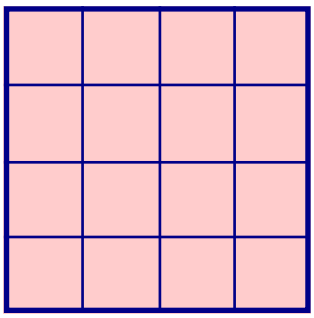
make a **four times** enlargement.

e



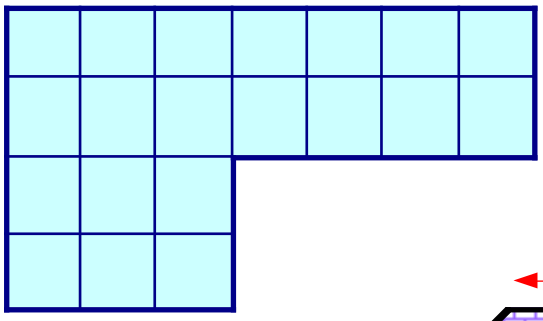
reduce this shape to **half** its size.

f



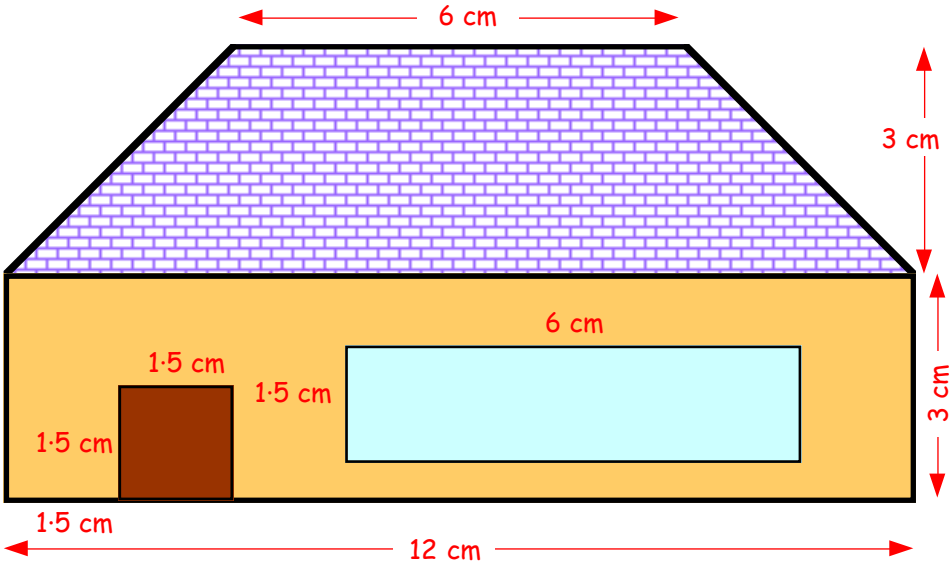
make this **half** size

g



make this **half** size.

h make this a **third** of the size shown



Scale Drawings (basic)

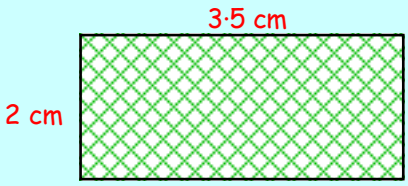
If you know the **scale** used in a drawing,

1 cm = 5 m

then you simply **multiply** any length (in centimetres) by **5** to determine the **real** length of the object (in metres).

Example :-

Scale :- 1 cm = 5 m



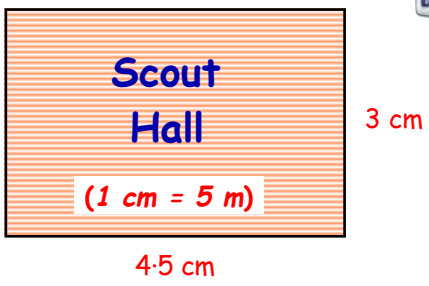
=> **real** length = 3·5 x 5 = **17·5 m**

=> **real** width = 2 x 5 = **10 m**

Exercise 2

1. This scale drawing of a scout hall is drawn to a scale of :-

1 cm = 5 m.

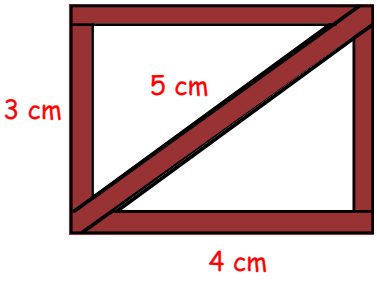


a Calculate the **real** width of the hall.

b Now calculate the **real** length of the hall.

2. This drawing of a garden gate is done using a scale :-

1 cm = 20 cm.

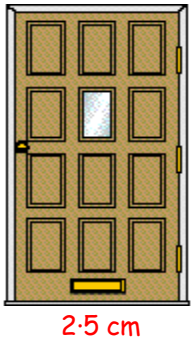


a Calculate the real width of the gate (... x 20).

b Calculate the real height of the gate.

c Calculate the real length of the diagonal support bar.

3.



This door has been drawn to a scale of :-

1 cm = 50 cm.

a Calculate the real height of the door.

b Calculate the real width of the door.

4. Farmer Giles' field is in the shape of a rectangle.

The scale is :- ***1 cm = 15 metres.***

a Calculate the real length and the real breadth of the field.

b Calculate the **perimeter** of the field.

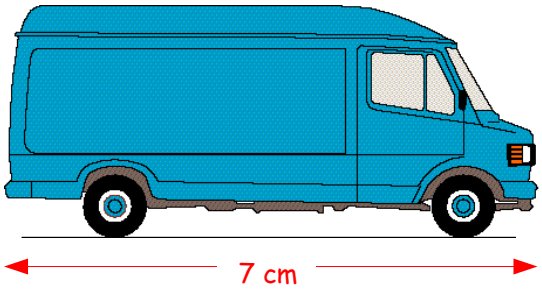
5. This drawing of a fridge-freezer is shown to a scale :-

1 cm = 40 cm.

Calculate the real height of the freezer.

Give your answer in metres (as a decimal).

6.



This van has been drawn to a scale of :-

1 cm = 0·5 metres.

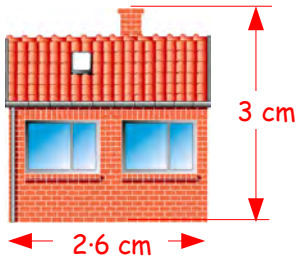
Calculate the length of the real van.

7. This house has been drawn to a scale of :-

1 cm = 2·5 metres.

a Calculate the real height of the house.

b Calculate the real length of the house.



*You will need a **ruler** for the remainder of this exercise.*

8. This snooker table has been drawn to a scale of :-

1 cm = 12 inches.

a Measure the length and measure the breadth of the snooker table in centimetres.

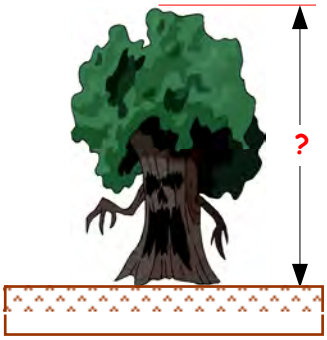
b Calculate the real length and breadth of the snooker table.

9. **a** Measure the height of this tree in centimetres.

b If the scale of the drawing is :-

1 cm = 8 metres,

calculate the real height of the tree.



10.

This guitar has been drawn to a scale :-

1 cm = 15 cm.

Measure the length of the guitar in the figure and calculate its real length.

11. **a** Use your ruler to measure the height of this balloon in centimetres.

The scale is :- ***1 cm = 3·5 m.***

b Calculate the real height of the balloon.

12.

This map of Britain has been drawn to a scale :-

1 cm = 50 miles.

a Check that the line from Glasgow to Aberdeen is 2·8 centimetres long.

Calculate the **real** distance from Glasgow to Aberdeen, in miles.

b For each of the following, measure the **shortest** distances between the towns in centimetres, then calculate the **real** distances between the towns in miles :-

(i) Glasgow to Wick

(ii) Glasgow to Liverpool

(iii) Edinburgh to London

(iv) Wick to Birmingham

(v) London to Plymouth.

c A jet, on an exercise, flies from Wick to London, then London to Carlisle and back again from Carlisle to Wick.

(i) Measure each of the three parts of the flight in centimetres.

(ii) Calculate each of the three flights in miles.

(iii) Calculate the total distance flown by the pilot.

Making Simple Scale Drawings

*You will need a **ruler** to draw the figures accurately in this exercise.*

Exercise 3

1. This is just a "rough" sketch of Janine's bedroom.

Make an accurate scale drawing of her room using a simple scale of :-

1 cm = 1 metre.

2.

This is a sketch of Lundow Bowling Green.

Make an accurate scale drawing of the bowling green using a scale of :-

1 cm = 4 metres.

a If 4 metres is represented by 1 centimetre in the scale drawing,

=> 40 metres (length) will be represented by (40 ÷ **4**) = ... centimetres.

Start your scale drawing by drawing a line ..... centimetres long.

b Also => 24 metres (breadth) will be represented by (24 ÷ **4**) = ... cm.

Now finish your scale drawing by drawing the width ? centimetres long and completing the rectangle.

3. This window frame measures 80 centimetres by 60 centimetres.

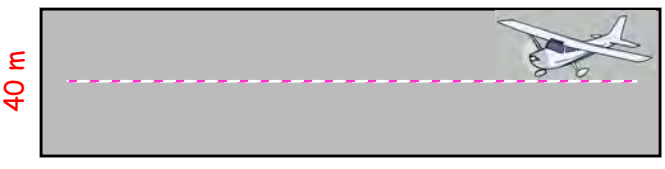
Make a scale drawing of the window frame using a scale :-

1 cm represents 10 cm.

4. This light aircraft runway at Aberdeen measures 200 metres by 40 metres.

Make a scale drawing of the runway.

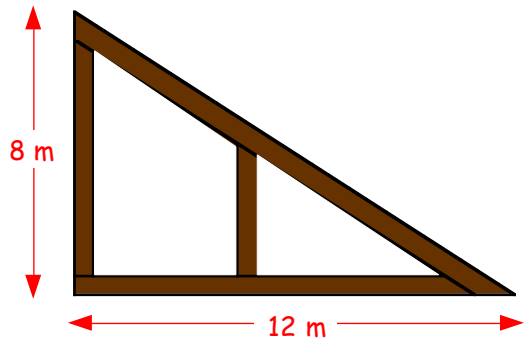
Scale :- ***1 cm = 20 m.***



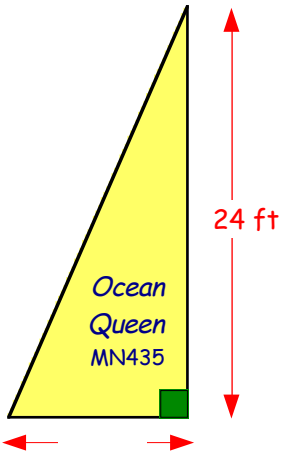
5. Shown is a wooden roof support. It is in the shape of a right angled triangle.

Make a neat scale drawing of the support using a scale of :-

1 cm = 2 metres.



6.



This triangular sail measures 12 feet by 24 feet.

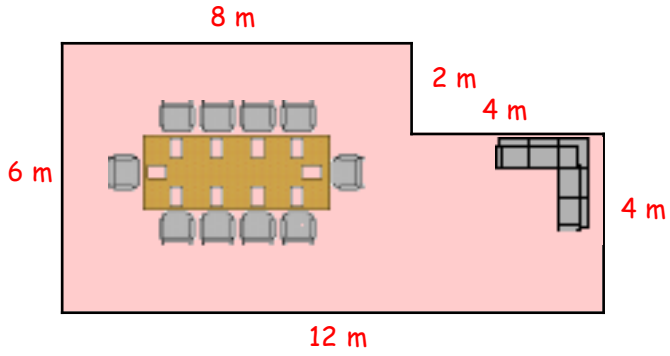
Make a scale drawing of the sail.

Scale :- ***1 cm = 3 feet.***

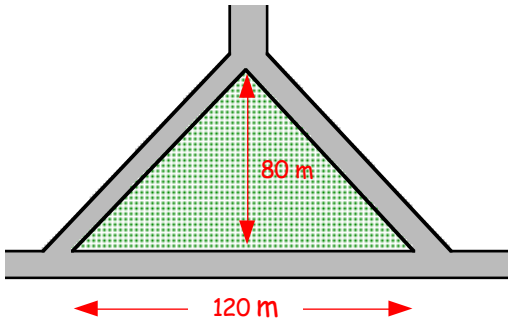
7. This "L-Shaped" board-room is 12 metres long and 6 metres wide.

Make a neat scale drawing of the room using a scale of :-

1 cm = 2 metres.



8.



This field, formed between three roads, is in the shape of an **isosceles triangle**.

The base of the field is 120 metres long and the "height" of the triangle is 80 metres.

Make a scale drawing of the field.

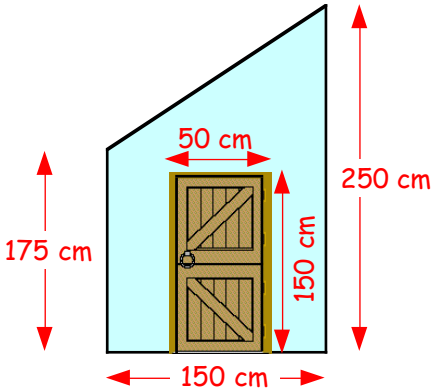
Scale :- ***1 cm = 20 metres.***

9. This sketch shows the side of a "lean-to" shed.

Make a scale drawing of it, using a scale of :-

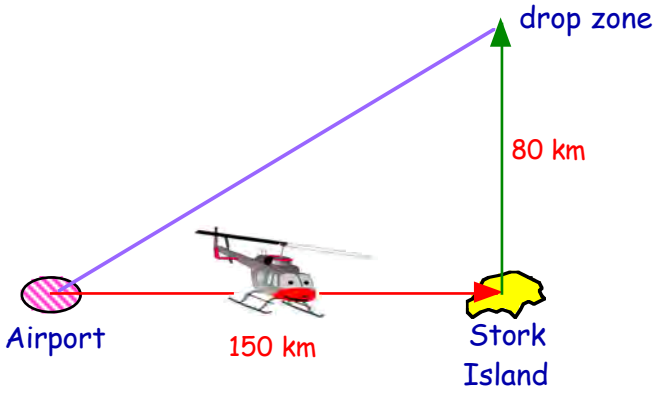
1 cm represents 25 cm.

(*Show the door in your drawing*).



10. A pilot sets off from the airport in his helicopter and flies 150 kilometres East towards Stork Island.

From Stork Island, he then flies North for 80 kilometres to his drop-zone.



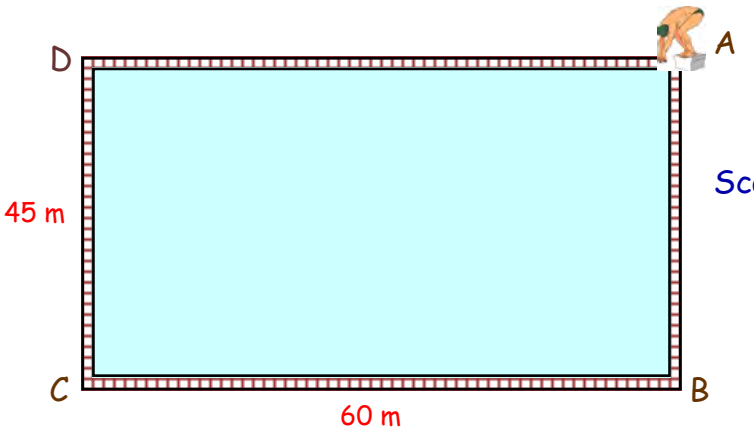
a Make a scale drawing of his trip.

Scale :- ***1 cm = 20 km.***

b Measure the length of the line joining the Airport to the drop zone on your drawing.

c Calculate the **real** distance from the Airport to the drop zone in km.

11. **a** Make a scale drawing of this swimming pool.



Scale :- ***1 cm = 5 metres.***

b David swims from corner A to corner C.

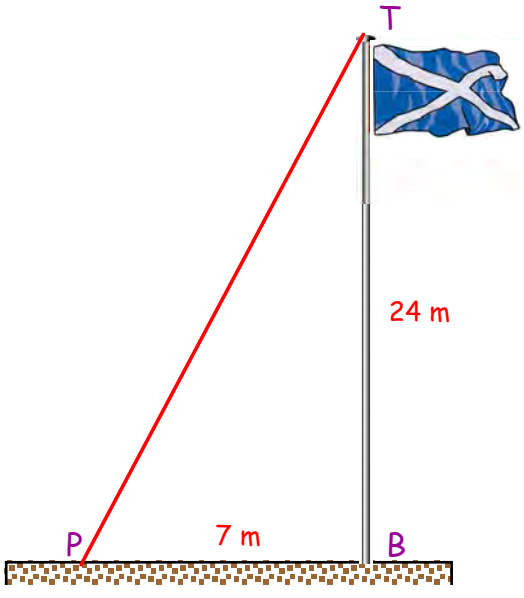
Show this as a dotted line **on your drawing**.

c Measure the length of the dotted line on your drawing, in centimetres.

d Calculate the **real** distance swam by David, in metres.

12. This flagpole is 24 metres tall.

A support wire is attached from the top (T) of the pole to a point (P) on the ground, 7 metres from the base (B) of the pole.



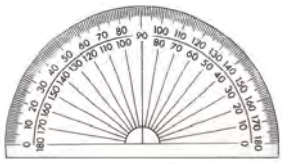
a Make a scale drawing showing the pole, the ground and the wire.

Scale :- ***1 cm = 2 metres.***

b Measure the length of the wire in your drawing (in cm).

c Now calculate the **real** length of the support wire.

Scale Drawings Using a Protractor



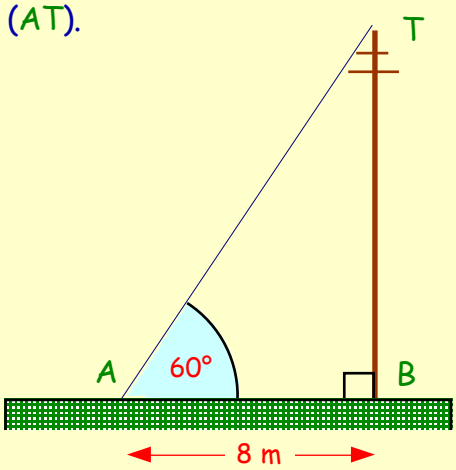
*You will need a **ruler** and **protractor** to draw the figures in this exercise.*

Exercise 4

1. The sketch shows a telephone pole supported by a wire (AT).

The distance from A to B is 8 metres.

$\angle TAB = 60°$.



a Make a scale drawing using a scale :-

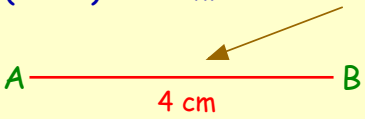
1 cm = 2 metres

b Use your drawing to calculate the real height of the pole.

Here's how to do it :-

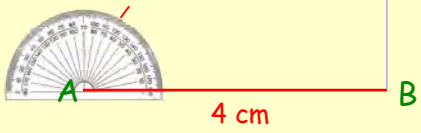
a ***Step 1 :-*** Scale 2 m = 1 cm

=> 8 m = (8 ÷ 2) = 4 cm. => draw AB = **4 cm**.



Step 2 :- Draw a (feint) line straight up from B to show the pole.

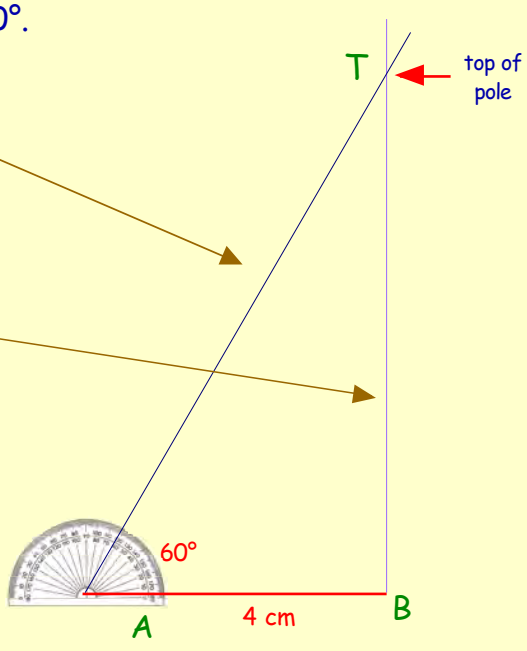
Step 3 :- Put your protractor on A and mark out an angle of 60°.



Step 4 :- Draw the 60° line from A till it crosses the line drawn up from B.

b ***Step 5 :-*** Measure the length from B to T, where the 2 lines cross (in cm).

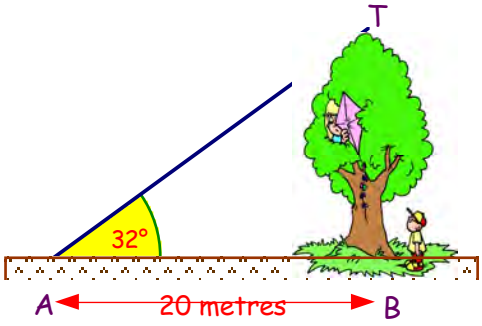
Step 6 :- Multiply this length by the scale (**x 2**) to obtain the **real** height in metres.



2. **a** Make a scale drawing to show this tree as it is viewed from point A.

Scale :- ***1 cm = 2 metres.***

- *start by drawing a line representing AB*
- *draw a feint line straight up from B*
- *use your protractor to measure out ∠A = 32°*
- *complete the drawing.*



b Measure, in centimetres, the height of the tree in your drawing.

c Calculate the height of the **real** tree.

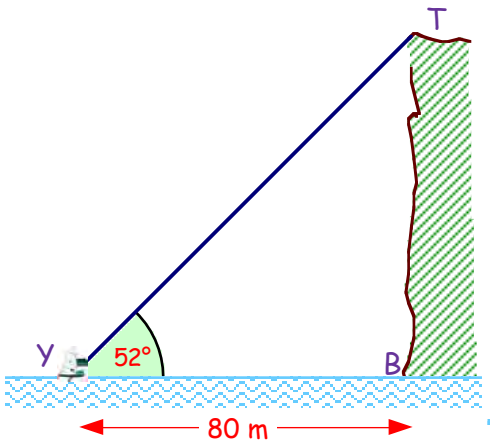
3. A yacht is 80 metres from the foot of a cliff.

The angle of elevation of the top of the cliff from the yacht is 52° (see sketch).

a Make a scale drawing of the yacht and the cliff.

Scale :- ***1 cm = 10 metres.***

b Calculate the **real** height of the cliff.



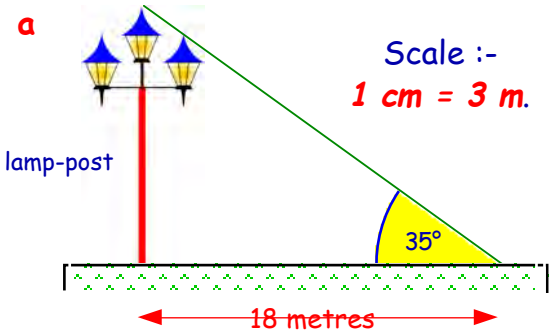
4. For each of the following six sketches :-

(i) Make a scale drawing using the given scale.

(ii) Calculate the **real** height of the given object.

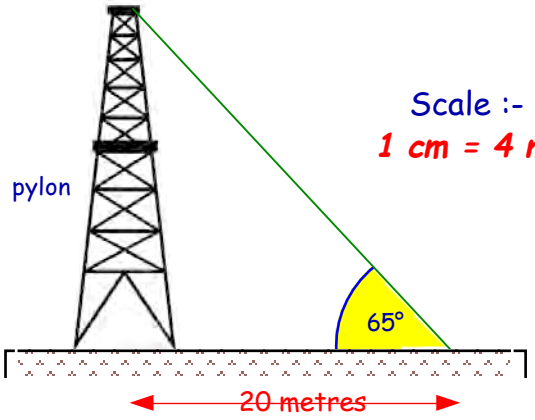
a

Scale :-
1 cm = 3 m.



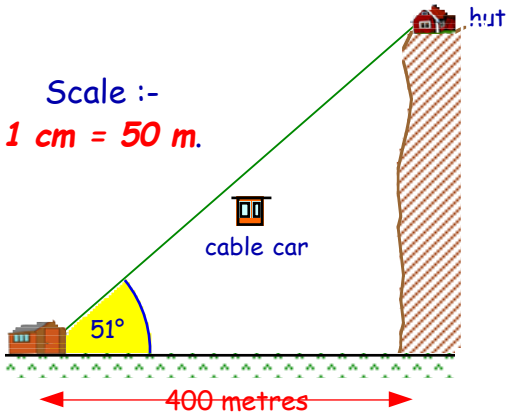
b

Scale :-
1 cm = 4 m.



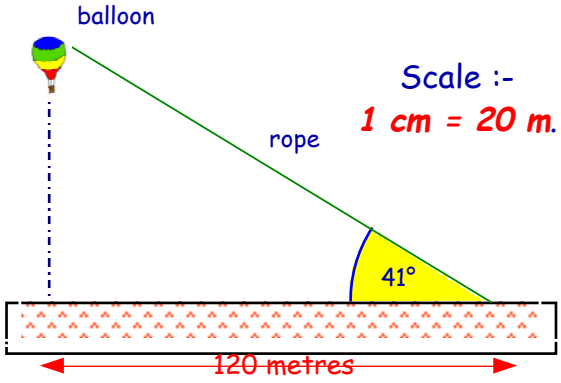
c

Scale :-
1 cm = 50 m.

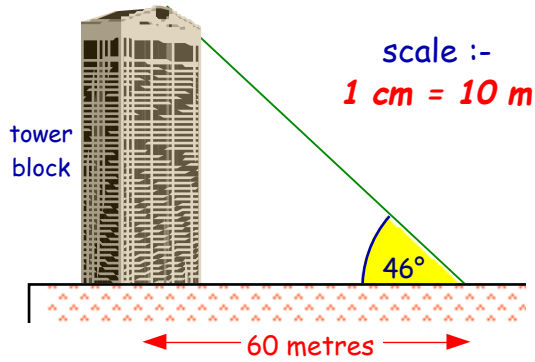


d

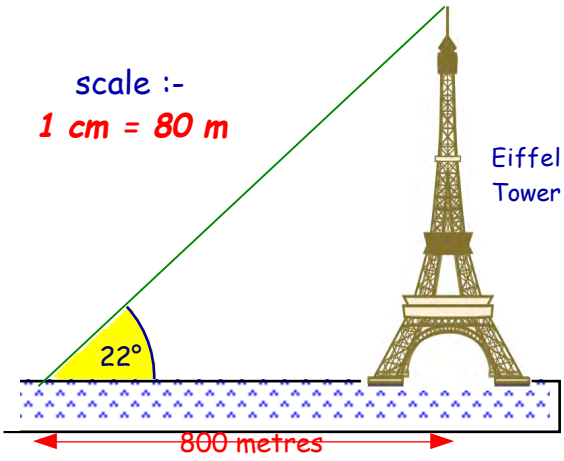
Scale :-
1 cm = 20 m.



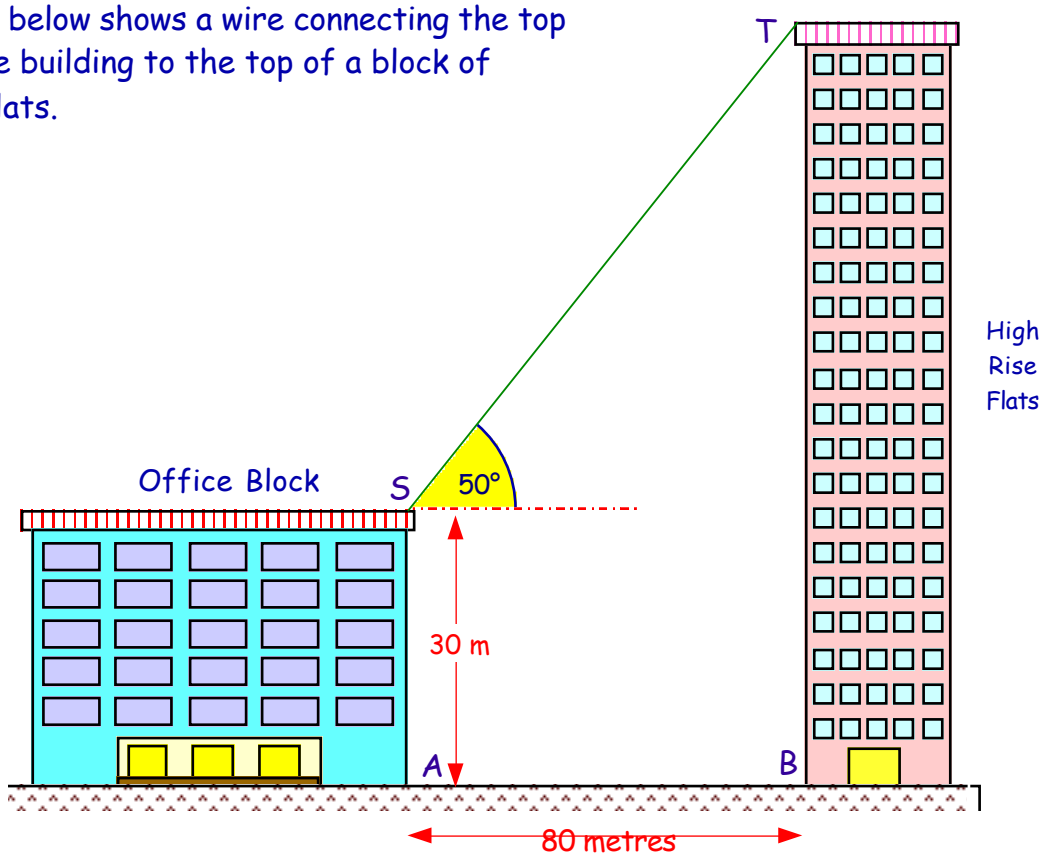
4. **e**



f



5. The sketch below shows a wire connecting the top of an office building to the top of a block of high-rise flats.



a Make a scale drawing using the scale ***1 cm = 10 metres***.

- *start with the line showing AB = ... cm*
- *add on the line showing AS = ... cm*
- *draw a feint line straight up from B*
- *put your protractor on top of S*
- *mark an angle of 50° at S*
- *complete the scale drawing.*

b Measure the length of the line BT in centimetres on your drawing.

c Calculate the **real** height of the block of high-rise flats, in metres.

Compass Points and Scale Drawings

Exercise 5

Remember

1 full turn = 360°

$\frac{1}{2}$ turn = 180°

$\frac{1}{4}$ turn = 90°

1. Make a copy of this compass rose and fill in the 4 missing "in-between" directions.

2. How many degrees are there from :-

a North to South (clockwise)

b North to East (clockwise)

c North to North-East (clockwise)

d North East to South (clockwise)

e North to West (clockwise)

f North to West (anti-clockwise)

g South East to South West (clockwise)

h SW to NW (anti-clockwise)

i NW to South (anti-clockwise)

j NE to SW (anti-clockwise) ?

3. **a** Iain was facing North. He then made a $\frac{1}{4}$ turn clockwise.

In which direction is Iain now facing ?

b Suzie was looking South, but made a $\frac{1}{2}$ turn clockwise.

In which direction was Suzie then facing ?

c Brian and Lucy were facing North East.

They then turned through 90° clockwise.

In which direction did they end up facing ?

d A bear was travelling due East. It made a 45° turn anti-clockwise. In which direction was it then facing ?

4. The map shows Craggy Island.

Middleton is the main town and lies in the centre of the island.

a From Middleton, what would I see if I faced :-

(i) North **(ii)** West

(iii) S East **(iv)** N West ?

b In which direction, from Middleton, is :-

(i) Windy City

(ii) the River Elm

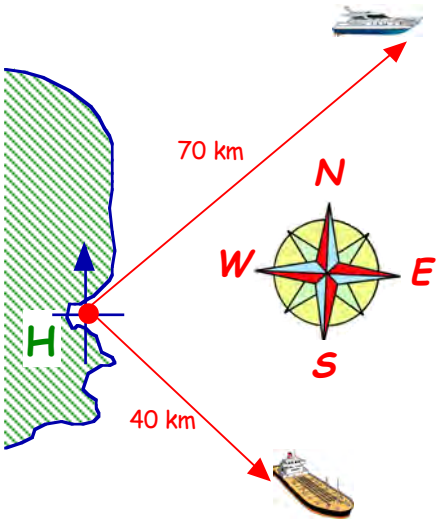
(iii) Finger Point

(iv) the Harbour ?

5. A speedboat and an oil-tanker leave harbour (H) at the same time.

The speedboat travels 70 kilometres north east.

The tanker sails 40 kilometres south east.



a Make a scale drawing of the two journeys.

Scale ***1 cm = 10 km***.

- *start by marking a point on your page to show H*
- *draw in the north-south and east-west lines thru' H*
- *use your protractor to show the 45° from north*
- *use your ruler to show the speedboat's journey*
- *repeat for the tanker's trip.*

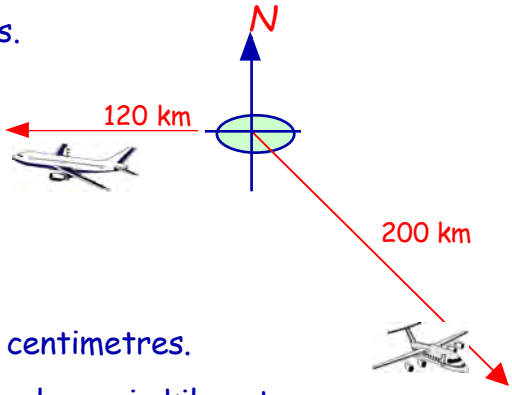
b Measure the distance between the two boats, in centimetres.

c Now calculate the **real** distance between them, in kilometres.

6. Two jet planes leave Charles de Gaulle Airport in Paris.

One flies West for 120 kilometres.

The other flies South East for 200 kilometres.



a Make a scale drawing of the two flights.

Scale ***1 cm = 20 km***.

b Measure the distance between the two planes, in centimetres.

c Now calculate the **real** distance between the two planes, in kilometres.

7. The sketch below shows the journey made by a pilot in a light aircraft.

He flew North East from Dulwich Airport for 60 kilometres to Pearl Island.

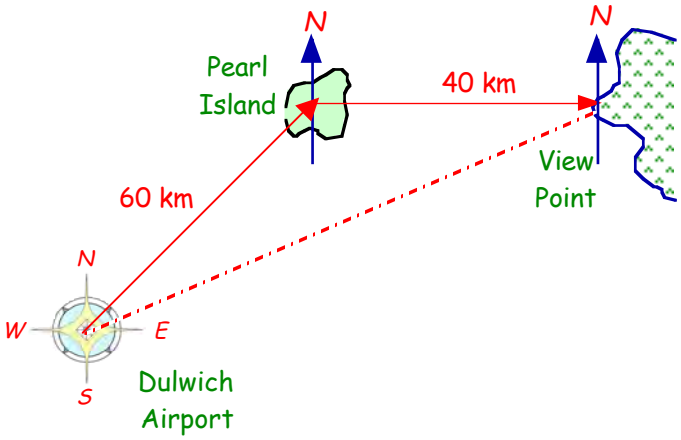
From Pearl Island, he then flew East for 40 kilometres to View Point.

a Make a scale drawing showing the two legs of the flight.

Scale ***1 cm = 5 km***.

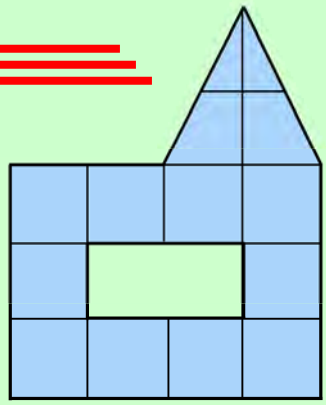
b Measure the distance from View Point to the airport, in centimetres.

c Calculate the **real** distance from View Point to the airport, in kilometres.

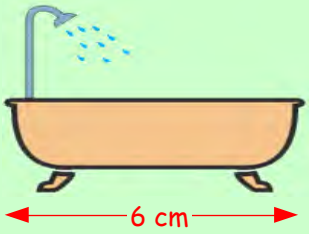


What Have I Learned ?

1. Make a two times enlargement of this figure.



2.



This bath has been drawn using a scale :-

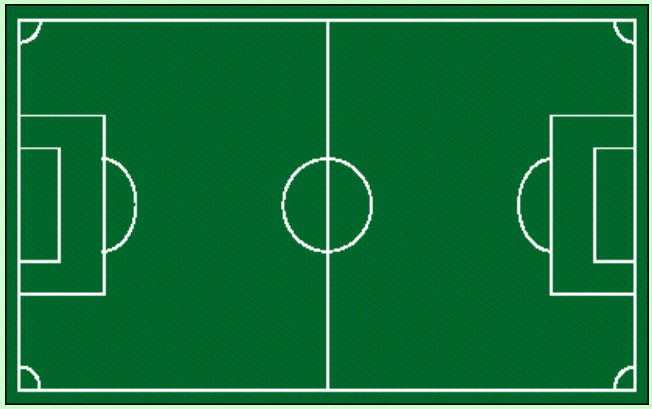
1 cm represents 30 cm.

Calculate the **real** length of the bath.

3. **a** Measure the length and breadth of this scale drawing of a football pitch.

Scale is :- ***1 cm = 12 metres.***

b Calculate the **real** length and breadth of the football pitch.



4.

Make a scale drawing of this door using a scale :-

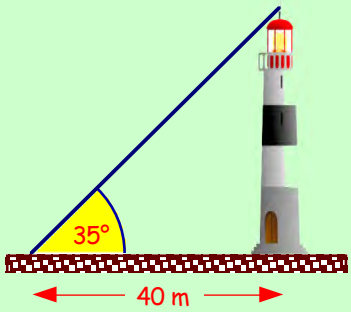
1 cm represents 20 cm.

5. A wire is attached from the top of a lighthouse to a point 40 metres from its base.

a Make a scale drawing of the lighthouse and wire.

Scale :- ***1 cm = 4 metres.***

b Measure the height of the lighthouse on your scale drawing, in centimetres.



c Now calculate the **real** height of the lighthouse, in metres.

6. **a** I am facing South. In which direction will I be facing if I turn through an angle of 45° clockwise ?

b A pilot changes from flying North West to a new direction of SW.

Through how many degrees and in what direction must he have turned ?

c A ship sails North East from Port Stanley to Elephant Island.

In what direction must she sail to return to Port Stanley from Elephant Island ?

CHAPTER 6

Hourly Rate

Lots of workers receive an **hourly rate** of pay.

David is a plumber.

His hourly rate of pay is £8·50.

Last week he worked 38 hours.

What was his **basic** pay ?

Pay = 38 x £8·50 = **£323·00**

Exercise 1

1. Jim is a shoe salesman with a basic rate of pay of £7·75 per hour.
   If he worked 40 hours last week, how much was he paid ?

2. ....telephone 07799 665544
   Secretary wanted for large textile company. Must have pleasant personality and be prepared to work overtime if required.
   Hourly rate **£7·40**
   phone 012345 678 901
   Joiner's assistant required
   .....

   a Brian started a new job as a secretary.
   In his first week, he worked 35 hours.
   Calculate his basic pay for this week's work.

   b In his 2nd week, he worked 42 hours.
   Calculate his pay for this week's work.

   c How much **more** did he earn in the 2nd week ?

3. David works as a computer programmer.
   His hourly rate of pay is £14·20.
   He worked for 60 hours last week.
   How much did he earn ?

4. Jarine works as a T.V. repair man for "T.V. RENTALS".
   He was very busy last week and worked for 52 hours.
   What was his basic pay for the week ?

T.V. RENTALS
"We keep you in the picture"
£8·80 per hour

5. Ralph was calculating the pay for each of his 5 mechanics.

Name	Ted	Bill	Nick	Tam	Dave
Hours	36	42	51	34	40

a Calculate the pay due to each of the 5 mechanics.

b Calculate Ralph's **total** wage bill for the week for his 5 employees.

6. A secretary was typing up a report for a Member of Parliament.

She was paid an hourly rate of £7·40.

It took her 15 hours to finish the report.

How much had she earned ?

7. 

"Brickies" are paid £11·15 an hour by Bob The Builder.

a How much would Terry earn if he worked 48 hours ?

b Steve only worked 41 hours. How much did he earn ?

c How much **more** did Terry earn than Steve ?

8. Susie works for a Nursing Agency and her friend Sandra is a typist.

Susie earns £9·75 per hour whereas Sandra is paid £7·20 per hour.

Last week, Susie worked 22 hours and Sandra 30 hours.

a Calculate Susie's pay and Sandra's pay for the week.

b How much **more** did Sandra earn than Susie ?

9. Gary is a long distance lorry driver for "National Express".

His rate of pay is £10·10 per hour.

During an overseas delivery to Italy, he drove for a total of 56 hours.

How much did Gary earn for this trip ?

10. 

Sally works in an office. She earns £7·55 per hour.

How much did she earn in February if she worked :-

Week 1	(1st – 5th February)	-	36 hours
Week 2	(8th – 12th February)	-	39 hours
Week 3	(15th – 19th February)	-	43 hours
Week 4	(22nd – 26th February)	-	32 hours

Calculating the Hourly Rate

If you know the total weekly wage for someone and you know the number of hours worked, you can calculate their hourly rate of pay by **dividing**.

Example :- Sara is a plumber and worked 42 hours last week.

Her total basic pay for the week was £327·60.

What was her hourly rate of pay ?

Hourly Rate = £327·60 ÷ 42 = 7·8 = **£7 · 80**.

Exercise 2

1. Arthur's payslip last week showed he earned £261.

He knew he had worked for 36 hours.

Calculate Arthur's hourly rate.

2. Toni is a barber and earned £328 last week.

He worked for 40 hours.

What is Toni's hourly rate of pay ?

3.

Ali is a chef. His wage last week was £283·90.

He had worked for 34 hours.

a Calculate his hourly rate of pay.

b This week he worked for 40 hours.

How much did he earn this week ? (**multiply !!**)

4. Nick works as a junior draftsman for ***HOUSEHOLD DESIGNS***.

He earned £354·90 last week for his 42 hours.

a Calculate his hourly rate of pay.

b This week he only worked for 25 hours.

How much pay is he due this week ?

5.

During the month of February, Andy worked 36 hours the 1st week, 42 hours the 2nd week, 40 hours the 3rd week and 44 hours the 4th week.

a How many hours did Andy work altogether in February ?

b If his total wage for the month was £1782, calculate Andy's hourly rate of pay.

6. Shown below, in a table, are the weekly wages and hours worked by 4 different workers in Meadow's Engineering.

Andy Designer	Valerie Secretary	Thomas Engineer	Jenny Tea-Lady
£584·00 40 hours	£215·60 28 hours	£633·60 44 hours	£72·60 12 hours

Calculate the hourly rate for each of the 4 workers.

7. Tim is a carpet fitter for Marywell Carpets.

He worked for 54 hours last week, fitting carpets in a new company's office.

a Calculate Tim's hourly rate.

b This week he only worked his standard 37 hour week.

How much did he earn this week ?

8. Brian is paid £9·50 per hour.

If he earned £342 last week, calculate the number of hours he must have worked. (**divide !!**)

9.

Lisa is a lifeguard at Matlock Open Air Swimming Pool.

Her hourly rate is £8·20.

She earns £410 every week.

How many hours does she work in a week ?

10. Ian is an electrician and earned £433·20 last week by working for 38 hours.

Simon is a plumber and earned £506 for working 44 hours last week.

Calculate the hourly rate of both and say who has the better rate of pay.

11. Mark started a job as a dental assistant.

He was promised an hourly rate of £7·90.

His payslip showed £250 for his 32 hours worked.

Had his employer kept his promise about his rate ?

Weekly & Monthly Pay

If you know a person's :-

monthly pay —> (x 12) to calculate the annual pay.

weekly pay —> (x 52) to calculate the annual pay.

Remember

52 weeks = 1 year

12 months = 1 year

annual means **yearly**

Exercise 3

1. Dick's monthly pay at Dodds Engineering is £1720.
   Calculate his **annual** (*yearly*) pay. – (***multiply by 12***).

2. Emma's payslip shows she earns £1450·25 every month.
   Calculate her **annual** pay.

3. 

   Karl is a sales assistant for COMTEK.
   He is paid £1512·75 per month.
   Calculate Karl's **annual** pay.

4. Eddie earns £1595·50 per month and his wife Sally earns £1610·25 per month.
   By how much is Sally's **annual** pay **greater** than Eddie's ?

5. David does a part-time paper round each morning.
   He is paid £42·50 **per week**.
   Calculate David's **annual** pay.

6. 

   Darlinda works in a bakery.
   She earns £348·50 per week.
   Calculate Darlinda's **annual** pay.

7. Johnny is a sign writer with CLARK CONTRACTORS.
   He is paid a weekly wage of £420·50.
   Calculate Johnny's **annual** pay.

8. Enid works for EASYTURF LANDSCAPE GARDENERS.

She has a weekly wage of £343·75.

Calculate her **annual** pay.

9.

Catrina works 35 hours per week as a filing clerkess.

Her rate of pay is £8·30 per hour.

a Calculate Catrina's **weekly** pay.

b Now calculate her **annual** pay.

10. Gregor works as a gardener for the Parks Department.

He is paid £7·45 per hour and works a standard 40 hours per week.

a How much does Gregor earn in a week ?

b Calculate his **annual** pay.

11. Dave and his brother Gary are both car mechanics.

Dave is paid monthly and earns £1860·50 per month.

Gary is paid weekly and gets £440·25 per week.

a Calculate Dave's **annual** pay.

b Calculate Gary's **annual** pay.

c Who earns more and by how much ?

12.

Eve is a manageress for SPARKS & MENCER and receives an annual salary of £25 145.

Sally is a sales assistant and is paid £1686·25 monthly.

Arthur is a van driver for the company and he is paid a weekly wage of £349·50.

a Calculate Arthur and Sally's **annual** pay.

b Of the three of them, who earns :-

(i) most **(ii)** least ?

13. Del and Trev, both painters for the same company, decide to check if both receive the same wage.

Del is paid monthly and receives £2100·80 per month.

Trev is paid weekly and earns £484·80 per week.

Is one of them paid more than the other ? *Explain* !!

If you know your **ANNUAL** pay you can easily calculate :- your weekly pay -> by **dividing** by **52**.
your monthly pay -> by **dividing** by **12**.

52 weeks = 1 year
12 months = 1 year

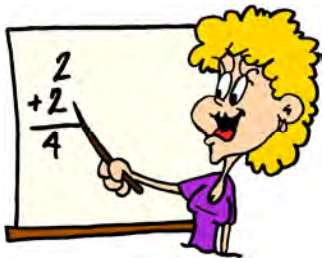
Exercise 4

1. Brian earns £25 860 per year as a car salesman.
   Calculate his **monthly** salary. (÷ *12*).

2. Cheryl has an annual (yearly) salary of £26 580 as a manageress with Q & B.
   Calculate her **monthly** pay.

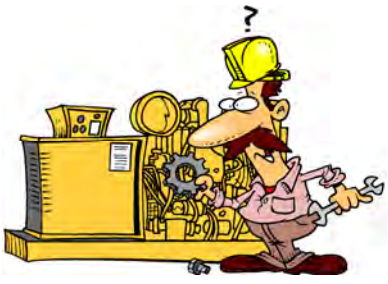
3. Brian works for an Internet Company and earns £30 294 annually.
   Calculate his **monthly** pay.

4. Ryan is a managing director for a paper company.
   His salary is £48K per year (£48 000).
   Calculate his **monthly** salary.



5. Jilly works as a Primary Teacher.
   Her starting salary is £28 386 per annum.
   Calculate her **monthly** pay.

6. Cathy works as a shop assistant for HOOTS THE CHEMIST.
   She is paid £13 689 per year.
   Calculate Cathy's **weekly** wage.



7. Grant is a photocopier repairman and earns a fixed salary of £24 895 per annum.
   Calculate Grant's **weekly** wage.

8. 

Julie is a photographer's assistant and is paid an **annual** salary of £22 022.

Calculate how much Julie is paid each week.

9. Nadine works as a manicurist for "Hands On" beauty salon.

She is paid an **annual** salary of £12 753.

Calculate Nadine's weekly wage.

10. 

Max starts work in a florists and earns an **annual** salary of £18 434.

How much does this work out at per week ?

11. Marty works for Micron Computers and earns £23 426 per year.

a Calculate what he should be paid every week.

b Micron is an American Company.

They pay their employees every **two** weeks.

How much is Marty paid every 2 weeks ?

12. Ai Yi is offered a job as a laboratory technician.

Her salary is £23 712 per year.

She can choose to be paid weekly or monthly.

a How much would her **monthly** salary be ?

b Now calculate how much she would earn **weekly** if this was the chosen method of payment.

REQUIRED
Lab Technician
£23 712 p.a.

13. 

Darren works a 40 hour week as a cattle auctioneer.

His **annual** salary is £27 040.

a Calculate his weekly pay.

b Now calculate Darren's **hourly** rate of pay.

14. Davy, after retiring, decided to work part-time in a fishmonger's shop for 25 hours every week.

His **annual** pay is £9620.

a How much does Davy earn each week ?

b Calculate his **hourly** rate.

Wage Rise (Percentage Work)

Remember :- To find 5% of £800 using a calculator.

5% of £800 = $(\frac{5}{100} \times 800)$ = $(5 \div 100) \times 800$ = **£40**.

Example :- David earned £12 500 last year as a tree surgeon.

This year he got a 4% pay rise.

Calculate his new annual salary.

Last year's salary =	£12 500
Rise = $(\frac{4}{100} \times 12\,500)$ =	+ £500
This year's salary =	**£13 000**

Exercise 5

In each of the following, set down the 3 lines of working as shown above.

1. Billy earned £20 400 last year as a telephone engineer.

This year he was given a 6% pay rise.

Calculate his new **annual** salary.

2.

Theresa is a bank clerk and earns £18 800 per year.

The bank awarded her a pay increase of 3%.

Calculate her new **annual** salary.

3. Sally has a weekend job at the Vets and earns £90 per week.

She asks for and gets a 15% pay rise.

What is her new weekly pay ?

4. "Rollands The Bakers" offers all of its workers a 5% pay rise.

Calculate the new pay due to each of the following workers at Rollands :-

a Tim is a baker and earns £21 400 per year.

b Marcia is a van driver and earns £17 500 per year.

c Natasha works in the baker's shop and earns £14 200 per year.

5. George is a manager in Reeds Furniture showroom and earns £24 500 per year.

George asked his boss for a 6% pay rise.

His boss offered him a rise of £1500 per year.

a Calculate what George's new wage would be with a 6% rise.

b Should he accept his boss' offer ?

6. Teddy earns £22 000 per year and Norrie earns £20 000 per year.

Teddy gets a 6% pay rise and Norrie a 7% rise.

Who got the bigger rise in money terms ?

7.

Melissa is a telephonist and her hourly rate of pay is £7·40. She normally works 30 hours per week.

a Calculate Melissa's weekly wage.

b If she gets a 5% pay rise, what will her new weekly pay be ?

8. Nigel's hourly rate of pay is £9·80. He receives a 5% pay rise.

a Calculate Nigel's new hourly rate of pay.

b If Nigel works 40 hours per week, calculate :-

(i) what his **old** weekly pay would have been.

(ii) what his **new** weekly pay is.

(iii) how much of a **rise** this is in his weekly pay.

9. Willie is a joiner with "McTaggart The Builder".

His hourly rate of pay is £12·35. He normally works a 40 hour week.

a Calculate Willie's basic pay last week for his 40 hours.

Willie also receives an extra £22·50 for every house in the new estate in which he hangs all the doors.

b Last week, Willie fitted out all the doors in 8 new houses.

How much "extra" was he paid ?

c What should Willie's **total** pay be for the week ?

d Because the company was doing well, his boss gave Willie an extra 15% of his total wages as a bonus last week.

Calculate Willie's **total** pay last week.

Commission

Some people, particularly sales-persons, do not get paid a weekly or monthly fixed wage.

They receive a percentage of the value of whatever they make by selling cars, carpets, etc.

This is called **COMMISSION**.

Example :- Ted sells cars. He is paid a **commission** of 5% on any car he sells.

Last week, Ted sold £24 000 worth of cars.

Commission = 5% of £24 000 = $\frac{5}{100}$ x 24 000 = **£1200**

Exercise 6

1. In "Arnold Vardy Motors", commission is paid at **3%** of sales.

Calculate the **commission** due by selling the following cars :-

a

£10 500

(i.e. $\frac{3}{100}$ x £10 500)

b

£20 800

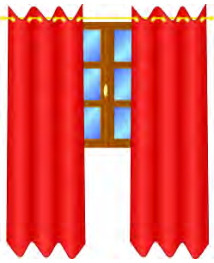
c

£15 600

2. Rebecca sells double glazing. She gets **7%** commission on any windows she sells.

Last month, she sold £23 500 worth of double glazing.

Calculate Rebecca's **commission**.



3.

Andrew works as a door-to-door salesman for "Bettaware", selling household goods.

Bettaware pays 15% commission.

How much **commission** is Andrew due this week if he sells £1600 worth of goods ?

4. Benny is an agent for "Littlehouse Clothing Store".

He sells clothes from a catalogue to his friends.

He receives 12% commission on his sales.

Last week he sold £1850 worth of goods.

Calculate his **commission**.

5. Brian is an agent for "Tipperware". He has a monthly pay of £1150.

Besides this, he also gets 10% commission on all sales he makes.

In January, he sold £5 320 worth of goods.

a Calculate his **commission** for January.

b Calculate his total pay for January.

6.

Lucy works for "Macron Computers" and has a monthly salary of £1775.

Last month she received a **bonus** of £680.

What was her total salary for the month ?

7. Diane works for a boat building company. She earns £18 500 per year.

This year, the company is doing well and Diane receives **bonuses** of :-

£550 in January, £280 in April, £870 in July and £435 in October.

a Calculate Diane's total bonus for the whole year.

b Now write down Diane's total salary for the year.

8.

Mike is a joiner and works on a building site.

He gets a bonus of £9·50 for every window frame he builds.

This week he built 32 frames.

Calculate Mike's total **bonus** for the week.

9. Claire is a hand painter for a mug manufacturer. She is paid £325·50 per week and gets a **bonus** of 52p for every mug she paints.

In a normal week she paints 500 mugs.

a Calculate Claire's bonus for painting 500 mugs one week.

b Calculate Claire's total pay for that week.

10.

Ally plays for a Junior Football Team.

He is paid £155 a week for playing.

In a big cup game last week he received a £25 **bonus** for every goal the team scored.

His team won the match 3-0.

How much did Ally get paid altogether last week ?

Overtime Pay

Overtime is when you work **extra hours** above your basic number of hours.

You get paid a **HIGHER RATE** of pay for **overtime**.

Double Time :- If your basic rate of pay is £8·50 per hour, you will get paid £17·00 per hour for every overtime hour you work (at **double time**).

Exercise 7

1. Richard works for the Roads Department and his basic rate is £7·00 per hour.

Last Sunday, he worked 6 hours **overtime** at **double time**.

a Calculate Richard's **overtime** hourly rate (*£7 doubled*).

b Calculate Richard's total **overtime pay**.

2.

Steve is a miner who is paid a basic rate of £12·40 per hour.

On Tuesday night, he worked 4 hours overtime for which he was paid **double time**.

a Calculate Steve's **overtime** hourly rate.

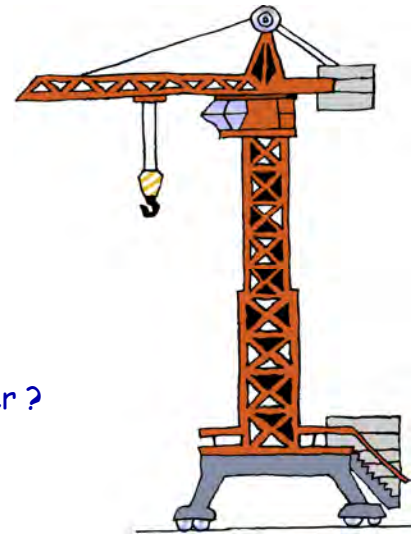
b How much did Steve earn in **total** for his 4 overtime hours ?

3. Lucy is a crane operator and her normal basic hourly rate is £11·60.

She worked a Bank Holiday Monday as **overtime** at **double time**.

a Calculate Lucy's overtime hourly rate of pay.

b If she worked 8 hours overtime on the Monday, how much was she paid for this overtime altogether ?



DAWSON & LAWSON

BUILDERS & FITTERS

Hourly Rate as shown

Brickie £9·20

Plumber £11·40

Electrician £10·20

Secretary £7·10

Joiner £10·60

Driver £9·80

4. The following people work for "Dawson & Lawson".

a Joe is an electrician who works 5 hours overtime (*double time*).

(i) Calculate Joe's overtime hourly rate of pay.

(ii) Calculate how much his overtime works out at.

b Billy is a secretary and last week he worked 6 hours overtime (*double time*).

(i) Calculate Billy's overtime hourly rate of pay.

(ii) Calculate how much Billy earned for his overtime work.

c Lindsay is a driver for "Dawson & Lawson".

Last week she worked 10 hours overtime at double time.

Calculate how much she was paid for her 10 hours overtime.
(*You need to work out her rate of pay for overtime first*).

d Pat the plumber did 12 hours overtime at double time last month.

Calculate Pat's total overtime pay.

e Nicky works as a joiner for the company. He worked 7 hours overtime one weekend at double time.

How much would he expect to be paid for his 7 hours ?

Example :- Tim's pay rate is £12·20 per hour

He works 5 hours overtime at "**time and a half**".

How much does he earn ?

Basic rate per hour (* note)	=	£12·20
Overtime rate = (**1·5** x £12·20)	=	£18·30
=> Overtime pay = (5 x £18·30)	=	**£91·50**

*** note**
"time and a half"
means $1\frac{1}{2}$ or 1·5
times your basic rate

For questions 5–8 of this exercise, overtime is paid at "time and a half".

5. Jimmy works as a fork lift operator for Glasgow Council.

His basic hourly rate of pay is £8·20.

a Calculate his overtime rate of pay (*at time and a half*).

b How much does he get paid if he works 4 hours overtime ?

6.

Martin is a greenkeeper at Pillok Golf Club.

His basic hourly rate of pay is £7·80.

a Calculate his overtime rate (*at time and a half*).

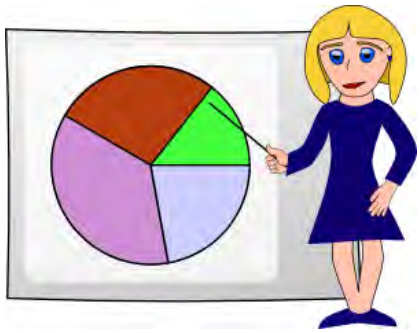
b During a golf tournament, Martin had to work 12 hours overtime, how much was he paid for this ?

7. Lisa is an office junior and is paid £7·20 per hour.

Last month she worked a total of 12 hours overtime at time and a half.

a Calculate Lisa's overtime rate of pay.

b Calculate how much she earned altogether for her 12 overtime hours.



8.

Kerry works in a Cattery looking after cats.

She is paid a rate of £6·36 per hour.

On Sunday, she worked 6 hours overtime at time and a half.

a Calculate Kerry's overtime rate of pay.

b Calculate how much she earned altogether for her 6 hours overtime.

9. Nick's basic hourly pay rate is £12·10. He works 5 hours overtime on Saturday.

a Nick thought he was getting paid **DOUBLE TIME** for this overtime.

(i) What would his hourly rate be for overtime at double time ?

(ii) What was he hoping to earn for his Saturday work ?

b The company only paid him an overtime rate of **time and a half**.

(i) What was his actual overtime rate (*at time and a half*) ?

(ii) How much did Nick actually earn for his Saturday work ?

c How much **less** did he earn than he originally thought ?

The following questions require you to calculate the basic pay, the overtime pay and the total pay. They are HARDER !!

10. Ken, who is a waiter, has a basic rate of pay of £8·20 per hour.
Last week, he worked his "normal" basic 40 hours.
He also worked 6 hours overtime at time and a half.
COPY this payslip for Ken and **complete** it.

Ken Stewart	*Payroll Number 0136*	*Date w/e 02/02/13*
Basic Rate = £8·20	***Overtime Rate = (1·5 x £8·20) =***	***£ .....***
Basic Pay =	40 x £8·20 =	£
+ Overtime Pay =	6 x £..... =	£
	Total Pay =	£

11. Lyn works as a dishwasher in the same restaurant as Ken.
Her basic hourly rate is £7·60.
Last week, she worked her "normal" basic 36 hours.
She also worked 10 hours overtime at time and a half.
COPY this payslip for Lyn and **complete** it.

Lyn Smith	*Payroll Number 0153*	*Date w/e 02/02/13*
Basic Rate = £7·60	***Overtime Rate = (1·5 x .....) =***	***£ .....***
Basic Pay =	36 x £7·60 =	£
+ Overtime Pay =	10 x £..... =	£
	Total Pay =	£

12. Make up a similar payslip for George Young, the head chef.
George's basic hourly rate of pay is £15·40.
This week, he worked his "normal" basic 38 hours.
He also worked 7 hours overtime at time and a half.
His payroll number is 0183. It is week ending 9th February, 2013.
Calculate his basic pay, overtime pay and total pay for the week.

13. Calculate Sean's total pay for the week. (*Do **not** write on the page*).

MCTAGGART'S					
Name : Sean O'Toole		Works Number – 0333			Week No. 17
Pay Rate	Basic Rate per hour			=	£10·20
	Overtime Rate (double time) = (2 x £10·20)			=	£ .....
	O'time Rate (time and a half) = (1·5 x £.....)			=	£.....
Wage	Basic Pay	=	40 x £10·20	=	£.....
	Sunday Pay (double time)	=	(4 x £....)	=	£.....
	Tuesday Pay (time and a half)	=	(3 x £....)	=	£.....
	Total Pay for week			=	**£.....**

Deductions on Payslips

GROSS PAY :- This is what you are paid by your employer.

DEDUCTIONS :- These are taken from your pay for various reasons. Find out about Income Tax, National Insurance, Superannuation, etc.

NET PAY :- This is your take home pay after DEDUCTIONS.

NET PAY = GROSS PAY – DEDUCTIONS

Exercise 8

1. Calculate the Net (take home pay) for each of the following :-

	Gross Pay	Deduction
a ***Tom***	£1560/month	£425
b ***Lyn***	£1806/month	£695
c ***Gary***	£13 945/year	£3 840
d ***Dan***	£1085·75/month	£288·65
e ***Sal***	£32 680/year	£9 654

	Gross Pay	Deduction
f ***Jim***	£375/week	£86
g ***Len***	£25 600/year	£6 580
h ***Ray***	£493·50/week	£88·25
i ***Bob***	£562·80/week	£193·75
j ***Malik***	£799·60/f'night	£208·75

2. Henry works as a waiter and earns £1350·75 per month.

His deductions usually come to £363·40 per month.

Calculate Henry's net (take home) pay.

3.

Emma starts work as a computer programmer at a salary of £22 500 per year.

She calculated that her total deductions come to £4956.

a Calculate Emma's **net** pay for the year.

b Calculate her net **monthly** pay.
(*Do you divide or multiply by 12 ?*).

4. Jimmy's boss, on the building site, promised him a wage of £530·50 last week.

Jimmy found that his total deductions came to £123·75.

Calculate Jimmy's **net** pay last week.

5.

Gayle is a teacher and earns £2525·60 per month.

Her total deductions come to £638·85.

Calculate Gayle's **net** pay for the month.

6. Davy earns £11·80 per hour as a long distance driver.

Last week, he worked his normal 40 hour week.

a Calculate Davy's gross pay for the week.

b His deductions last week came to £98·50.

Calculate Davy's **net** pay.

7.

Nicole earns £10·75 per hour as a nurse.

This week, she worked a total of 44 hours.

a Calculate Nicole's gross pay for the week.

b If her deductions came to £106·48, calculate Nicole's **net** pay for the week.

8. Ken works for "McNicol's The Builders". His basic rate of pay is £12·60 per hour. One week, Ken worked his basic 40 hour week. He also worked 5 hours overtime at **time and a half**.

a Calculate Ken's total gross pay for the week.

b If his deductions came to £122·45, calculate Ken's **net** pay for the week.

9. Shown is Norman's payslip for last week.

BLOGGS ENGINEERING									
Name :- Norman Bates				Works No. :- 31720				Week No :- 16	
Income	*Basic* -	£675·60	*O/Time* -	£43·20	*Bonus* -	.....	**Total** -	£.....	
Deducts	*I. Tax* -	£108·76	*Superan* -	£22·50	*Nat Ins* -	£32·70	**Total** -	£.....	
							Net Pay	£.....	

a Calculate Norman's total gross pay.

b Calculate his total deductions.

c What is Norman's net (*take home*) pay for the week ?

10. For each of the following payslips, calculate :-

(i) Gross Pay **(ii)** Total Deductions **(iii)** Net Pay.

a

BLOGGS ENGINEERING									
Name :- Woody Pecker				Works No. :- 21056				Week No :- 16	
Income	*Basic* -	£623·60	*O/Time* -	£39·45	*Bonus* -	£50·00	**Total** -	£.....	
Deducts	*I. Tax* -	£143·15	*Superan* -	£30·75	*Nat Ins* -	£36·80	**Total** -	£.....	
							Net Pay	£.....	

b

BLOGGS ENGINEERING									
Name :- Lois Lane				Works No. :- 18036				Week No :- 16	
Income	*Basic* -	£503·75	*O/Time* -	-	*Bonus* -	£25·00	**Total** -	£.....	
Deducts	*I. Tax* -	£75·63	*Superan* -	£19·75	*Nat Ins* -	£22·80	**Total** -	£.....	
							Net Pay	£.....	

10. c

BLOGGS ENGINEERING

Name :- James Riddle	Works No. :- 17402	Week No :- 16

Income	*Basic -*	£685·75	*O/Time -*	£109·72	*Bonus -*	-	**Total -**	£.....
Deducts	*I. Tax -*	£152·70	*Superan -*	£32·75	*Nat Ins -*	£41·37	**Total -**	£.....
						Net Pay		£.....

d

BLOGGS ENGINEERING

Name :- Ally McStay	Works No. :- 36234	Week No :- 16

Income	*Basic -*	£799·70	*O/Time -*	£109·72	*Bonus -*	£75·00	**Total -**	£.....
Deducts	*I. Tax -*	£163·64	*Superan -*	£37·93	*Nat Ins -*	£41·85	**Total -**	£.....
						Net Pay		£.....

e

BLOGGS ENGINEERING

Name :- Ann Robinson	Works No. :- 31307	Week No :- 16

Income	*Basic -*	£603·65	*O/Time -*	£85·50	*Bonus -*	£50·00	**Total -**	£.....
Deducts	*I. Tax -*	142·75	*Superan -*	£30·72	*Nat Ins -*	£34·29	**Total -**	£.....
						Net Pay		£.....

11. Gazza works as a sales assistant for "LOWRIES MOTORS".

He receives a basic monthly salary of £1875·50.

He also gets 3% commission on any cars he sells.

This month, he sold £42 000 worth of 2nd hand cars.

a Calculate how much commission he is due. (3% of £42 000).

b Calculate his total gross pay. (£1875·50 + £ ?)

c If Gazza's deductions this month total £823·60, what is his **net** pay ?

What Have I Learned ?

1. George is paid £1950·50 per month. Calculate his **annual** pay.

2. Emile is paid £7·80 per hour as a library assistant.
   How much did he earn last week in which he worked for 38 hours ?

3. Dobbs, the Landscape Gardeners, pays its workers a basic rate of £7·20 per hour.
   a What would the **overtime** hourly rate be at "**double time**" ?
   b What would the **overtime** hourly rate be at "**time and a half**" ?

4. Natalie works for Dobbs. On Sunday she worked 4 hours overtime at "double time". How much overtime pay did Natalie receive ?

5. Billy works in a florist shop. The owner pays him a basic rate of £9·90 per hour.
   Last week Billy worked his normal basic 40 hours.
   He also did 5 hours overtime at "**time and a half**".
   a Calculate Billy's **basic** pay. b Calculate his **overtime** pay.
   c Calculate the **total** amount Billy was paid last week.

6. Last year Nadia's pay was £12 400.
   This year she received a 4% pay rise.
   a Calculate the actual pay rise due to Nadia.
   b Now calculate Nadia's new **annual** pay.

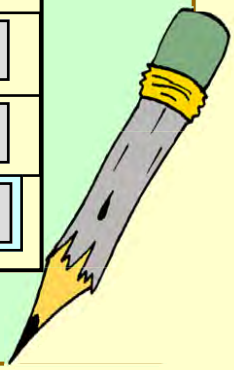
7. Davie sells cars for Hamilton's Motors. He receives 3% **commission** on any car he sells. He sold a new Renault car for £13 500. How much commission is he due ?

8. Shown is Johnny Rotten's pay slip. Calculate his **NET** pay for the week.

BLOGGS ENGINEERING

Name :- Johnny Rotten	Works No. :- 17541	Week No :- 22

Income	*Basic* -	£755·95	*O/Time* -	£89·77	*Bonus* -	£25·00	**Total** -	£.....
Deducts	*I.Tax.* -	£161·30	*Superan* -	£39·25	*Nat Ins* -	£44·57	**Total** -	£.....
							Net Pay	£.....



CHAPTER 7

Tidying Up Terms

Adding & Subtracting terms

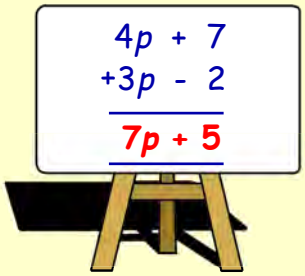
It is possible to "tidy up" expressions by :-

adding or subtracting all **like terms**.

Example 1 :- $8x + 3x - 5x = 6x$

Example 2 :- $4p + 7 + 3p - 2 = 7p + 5$

Example 3 :- $3a + b + a = 4a + b$



Exercise 1

1. **Copy** each of the following and then give a simplified answer below each one :-

a	$3x + 5x$	b	$7x - 2x$	c	$9x + x$
d	$3x - x$	e	$6x + 3x + 2x$	f	$9x + 2x + x$
g	$x + x + x$	h	$2x + 5x - 4x$	i	$10p + 7p - 12p$
j	$7a + 2a - a$	k	$20t - 10t + 2t$	l	$30g - 20g - g$
m	$d + d - d$	n	$2y + 4y - 5y$	o	$8m - 3m - 2m$
p	$17x - x - 10x$	q	$8w - w - 7w$	r	$2a - a + 5a$
s	$f + f + f + f$	t	$f + f + f - f$	u	$3f + 2f + 5f + 4f.$

2. **Copy** each of the following and then give a simplified answer below each one :-

a	$3x + 5x + 2x - 9x$	b	$5y - y + 2y - 3y$	c	$3x + 2 + 8x$
d	$5x + 4x + 1$	e	$3a - 1 + 5a$	f	$3w + 4 + w + 4$
g	$2a + 4 - a + 4$	h	$3y + 1 - 2y - 1$	i	$2x + 3y + 4x + 5y$
j	$3a + 2b + 4a + 8b$	k	$5p + 3q - 2p - q$	l	$7g + h - g + 4h$
m	$x + x + x + 2y$	n	$3a + 2a + 1 + 8a$	o	$4x + 4y + 4x$
p	$3p + q + 2p + q + p + q$	q	$8g + 2h - 7g - h + 3g + 4h$		
r	$4x + 4y + 4 - 3x - 3y + 3$	s	$2p^2 + 6p^2 + 2q^2 - 7p^2 - q^2.$		

$1b + 2b = 3b$

Multiplying terms

A few more examples.

This time with multiplication :-

Example 1 :-

$4x \times x$
$= 4 \times x \times x$
$= 4x^2$

Example 2 :-

$3y \times y$
$= 3 \times y \times y$
$= 3y^2$

Example 3 :-

$6w \times w$
$= 6 \times w \times w$
$= 6w^2$

Exercise 2

1. Simplify :-

a	$5 \times a$	b	$3 \times p$	c	$2 \times t$	d	$7 \times y$
e	$m \times 8$	f	$w \times 2$	g	$a \times b$	h	$c \times f$
i	$d \times y$	j	$a \times a$	k	$b \times b$	l	$m \times m$
m	$2d \times e$	n	$5p \times q$	o	$7m \times n$	p	$4a \times a$
q	$7b \times b$	r	$2r \times 3s$	s	$5u \times 3v$	t	$7g \times 5h$
u	$2a \times 3a$	v	$2m \times 7m$	w	$f \times 3f$	x	$4w \times 8w$.

Multiplying Out Brackets

When you multiply two or more terms within a set of brackets by a number, you must multiply **each** of the terms by that number.

Example 1 :-

$4(x + 3)$
$= 4x + 6$

Example 2 :-

$3(x - 2)$
$= 3x - 6$

Example 3 :-

$5(2a + 4)$
$= 10a + 20$

Exercise 3

1. Multiply out the brackets :-

a	$2(x + 1)$	b	$3(x - 2)$	c	$4(x + 7)$
d	$5(x - 3)$	e	$7(y - 1)$	f	$9(t - 2)$
g	$10(a + 7)$	h	$20(w + 5)$	i	$17(y + 1)$
j	$3(x - y)$	k	$5(a + b)$	l	$2(p - q)$
m	$8(g + h)$	n	$2(x + y + 2)$	o	$6(x + y + 1)$
p	$5(x - y - 2)$	q	$3(2x + 1)$	r	$6(3a - 2)$
s	$2(6p - 4)$	t	$7(2t + 5)$	u	$4(5q - 1)$
v	$100(5v - 2)$	w	$3(2x + 3y + 1)$	x	$2(4x - y + 5)$.

Tidying up after Removing Brackets

A few more examples - This time, tidying up after expanding brackets :-

Example 4 :-
$3(2x + 4) - 1$
$= 6x + 12 - 1$
$= \mathbf{6x + 11}$

Example 5 :-
$4(x + 2) - 3$
$= 4x + 8 - 3$
$= \mathbf{4x + 5}$

Example 6 :-
$2(3x - 4) + 2$
$= 6x - 8 + 2$
$= \mathbf{6x - 6}$

2. Multiply out the brackets and then simplify. (*Show all working*) :-

a	$2(x + 1) + 1$	**b**	$3(x + 2) + 4$	**c**	$4(w + 3) - 9$
d	$5(v + 2) - 10$	**e**	$2(x + 4) + x$	**f**	$8(y + 1) - y$
g	$7(g + 2) + g$	**h**	$2(w - 3) - w$	**i**	$3(x - 1) - 2x$
j	$5(y - 1) + 2y$	**k**	$8(x + 3) + 4x$	**l**	$3(h - 2) + 10h$
m	$2 + 3(x + 1)$	**n**	$6 + 2(x + 4)$	**o**	$6 + 2(x - 1)$
p	$10 + 4(x - 2)$	**q**	$2(x + 1) + 2(x + 2)$	**r**	$5(y + 2) + 2(y + 1)$
s	$8(y + 1) + 3(y - 1)$	**t**	$10(w + 2) + 5(w - 1)$	**u**	$3(a + 4) + 2(a + 6)$
v	$6(c + 3) + 2(c - 8)$	**w**	$3(x + 1) + 2(x + 3) + 5$		
x	$5(x + 2) + 3(x + 4) - 20$	**y**	$2(x + 4) + 6(x - 1) - 2.$		

Solving Basic Equations

There are various ways of solving equations.

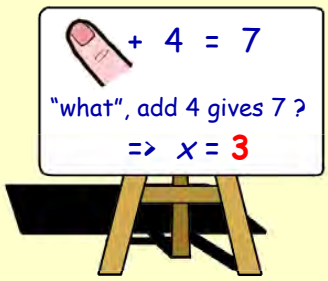
Your teacher will show you one such way.

Example 1 :-
$x + 4 = 7$
$\mathbf{x = 3}$

Example 2 :-
$x - 2 = 10$
$\mathbf{x = 12}$

Example 3 :-
$x - 7 = 14$
$\mathbf{x = 21}$

Cover-up Method



Exercise 4

1. Solve to find the value of x :- (*Use the method shown to you by your teacher*)

a	$x + 1 = 3$	**b**	$x + 5 = 9$	**c**	$x + 7 = 15$
d	$x + 8 = 20$	**e**	$x - 1 = 3$	**f**	$x - 2 = 18$
g	$x - 10 = 0$	**h**	$x - 40 = 50$	**i**	$x + 5 = 5$
j	$x - 4 = 0$	**k**	$x + 17 = 18$	**l**	$x - 100 = 100$
m	$4 - x = 1$	**n**	$3 + x = 7$	**o**	$6 - x = 0$
p	$37 + x = 100$	**q**	$12 - x = 7$	**r**	$50 + x = 50.$

Equations involving Multiplication

A few more examples.

Example 4 :-

$3x = 30$

$x = 10$

Example 5 :-

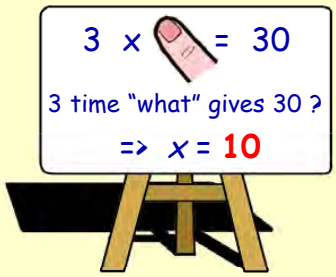
$4x = 12$

$x = 3$

Example 6 :-

$6x = 24$

$x = 4$



2. Find the value of each letter in the following equations :-

a	$2x = 12$	**b**	$3m = 24$	**c**	$5p = 35$
d	$8q = 40$	**e**	$6t = 18$	**f**	$9a = 90$
g	$4b = 32$	**h**	$7d = 21$	**i**	$2x = 7$
j	$2p = 11$	**k**	$4p = 14$	**l**	$6m = 21$
m	$10x = 105$	**n**	$8t = 20$	**o**	$12p = 30$
p	$10b = 45$	**q**	$4c = 15$	**r**	$4n = 21.$

Solving Equations (harder)

Example 1 :-

$2x + 1 = 15$

$2x = 14$

$x = 7$

Example 2 :-

$3a - 2 = 13$

$3a = 15$

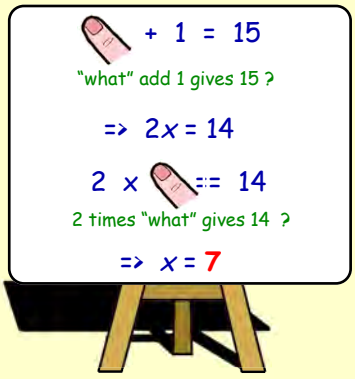
$a = 5$

Example 3 :-

$4a - 3 = 21$

$4a = 24$

$a = 6$



Exercise 5

1. Find the value of x by solving these equations :-
(*Use the method shown to you by your teacher and set down your working carefully.*)

a	$2x + 1 = 7$	**b**	$2x + 4 = 14$	**c**	$3x + 5 = 11$
d	$5x + 1 = 36$	**e**	$2x - 1 = 5$	**f**	$2x - 3 = 7$
g	$4x - 4 = 24$	**h**	$3x - 5 = 16$	**i**	$6x - 1 = 47$
j	$7x - 3 = 53$	**k**	$8x + 5 = 29$	**l**	$9x - 4 = 41$
m	$3x - 8 = 1$	**n**	$4x + 10 = 14$	**o**	$5x + 10 = 10$
p	$3x - 3 = 63$	**q**	$4x - 4 = 0$	**r**	$2x - 1 = 0$
s	$6x - 3 = 12$	**t**	$8x + 5 = 25$	**u**	$6x - 11 = 25.$

Solving Equations with Brackets

Example 1 :-

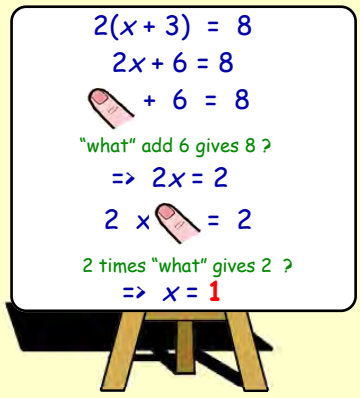
$2(x + 3) = 8$
$2x + 6 = 8$
$2x = 2$
$x = 1$

Example 2 :-

$4(x + 2) = 16$
$4x + 8 = 16$
$4x = 8$
$x = 2$

Example 3 :-

$3(x - 2) = 9$
$3x - 6 = 9$
$3x = 15$
$x = 5$



Exercise 6

1. Solve these equations by multiplying out the brackets first :-
(*use the method shown to you by your teacher*)

a	$2(x + 4) = 10$	**b**	$3(x + 1) = 9$	**c**	$4(y + 2) = 20$
d	$5(p + 4) = 40$	**e**	$8(w + 3) = 40$	**f**	$6(m + 2) = 48$
g	$3(a - 1) = 6$	**h**	$2(x - 5) = 4$	**i**	$2(p - 2) = 12$
j	$4(g - 3) = 0$	**k**	$7(x - 1) = 7$	**l**	$10(x - 10) = 200$
m	$9(d + 1) = 36$	**n**	$8(p - 6) = 0$	**o**	$7(r + 2) = 42.$

Solving Equations with Four Terms

Example 1 :-

$4x + 1 = 2x + 11$
(take "$2x$" from each side)
$2x + 1 = 11$
$2x = 10$
$x = 5$

Example 2 :-

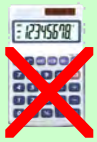
$7x - 2 = 3x + 18$
(take "$3x$" from each side)
$4x - 2 = 18$
$4x = 20$
$x = 5$

Exercise 7

1. Solve these equations by removing an appropriate number of x's from each side first :-
(*use the method shown to you by your teacher*)

a	$2x + 1 = x + 3$	**b**	$2x + 4 = x + 9$	**c**	$5x + 3 = 4x + 9$
d	$8x + 6 = 7x + 14$	**e**	$2x - 1 = x + 5$	**f**	$2x - 3 = x + 7$
g	$4x - 3 = 3x + 7$	**h**	$9x - 1 = 8x + 19$	**i**	$3x + 4 = x + 6$
j	$4x + 1 = 2x + 11$	**k**	$6x - 1 = 4x + 5$	**l**	$3x - 7 = x + 1$
m	$8x + 1 = 5x + 7$	**n**	$5x + 2 = x + 22$	**o**	$7x - 3 = 2x + 32$
p	$10x - 2 = 4x + 40$	**q**	$4x - 4 = 2x + 40$	**r**	$9x + 1 = x + 41.$

What Have I Learned ?



1. Simplify :-

a	$4p + 9p$	**b**	$8p - 7p$	**c**	$5p + 4p - p$
d	$3m + 4 + 5m$	**e**	$8v - 2 - 7v$	**f**	$2x + 5 - x + 3$
g	$4a + 2y + 3a + 4y$	**h**	$8x + 5y - 2x - 3y$	**i**	$10p + 7q - 3p - 2q.$

2. Work out the brackets :-

a	$5(x + 1)$	**b**	$6(x - 4)$	**c**	$3(x - 2)$
d	$7(x + 8)$	**e**	$2(a + b)$	**f**	$5(p - q)$
g	$2(3x + 4)$	**h**	$4(2w - 1)$	**i**	$10(x + y + 2z)$
j	$3(2a - 3b + c)$	**k**	$5(3p - 2q + 4r)$	**l**	$\frac{1}{2}(6a + 4b + 2c).$

3. Multiply out the brackets and then simplify :-

a	$4(x + 1) + 6$	**b**	$7(y - 1) + 7$	**c**	$3(t + 2) + 5t$
d	$8 + 2(2x + 3)$	**e**	$4 + 3(x - 1)$	**f**	$2(x + y) + 3(3x + 2).$

4. Solve :-

a	$x + 4 = 11$	**b**	$y - 2 = 13$	**c**	$15 - a = 5$
d	$2m = 18$	**e**	$4p = 14$	**f**	$2c + 1 = 15$
g	$3k + 4 = 22$	**h**	$7d - 3 = 32$	**i**	$2(x + 3) = 16$
j	$3(y - 2) = 18$	**k**	$7x + 2 = 3x + 30$	**l**	$5a - 10 = 3a + 10.$

CHAPTER 8

Money 1

Simple Interest

There are many different types of bank accounts.

Exercise 1

1. There are two main reasons why, if you should come into a sum of money, you should put it in a bank (or building society).

   Write down the reasons.

2. Dave and Sally put their combined savings of £8 000 into "SCOTIA BANK".

   How much **interest** would they receive after 1 year ?
   (*3% of £8 000*).

3. 

   Kenny sells his flat for £35 000 and leaves the money in SCOTIA BANK for 1 year whilst he travels around Australia.

   How much **interest** is Kenny due at the end of the year ?

4. Some friends compare the **interest** they are due from various banks and building societies for 1 year.

   a Tanya left £6 500 for a year. Rate = 4% p.a.

   b Alan deposited £9 200 for a year. Rate = 2·5% p.a.

   c Alison banked £11 400 for a year. Rate = 3·5% p.a.

   d Richard invested £6 850 for a year. Rate = 4·1% p.a.

   Calculate how much **interest** each person is due.

5. 

   Tony won £18 000 on the Rovers' Pools. He was about to invest it in his savings account at Edinburgh Royal Bank.

   a How much interest would he have received if he had invested the money into his savings account ?

   b Instead, he asks for the "special" saver's rate.

   How much interest did he actually get at the end of the year ?

6. Brian invested £5 200 in a special savings account at his bank for 1 year.

The annual interest rate was 3·7%.

His friend Julie saved £4 800 in her building society account for 1 year and received a rate of 4·0% per annum.

Which of the two received more interest in total after 1 year ?
(*You will have to calculate both Brian's and Julie's interest*).

7. I decide to invest £6 000 with the "Western Building Society".

a How much interest would I expect after 1 year ?

b How much would my total savings then be ?
(*£6 000 + £..... =*)

Annual Interest Rate 4%

8. I deposited £3 400 in my bank account for 1 year. The annual interest rate was 3·5%.

a Calculate my interest after 1 year.

b How much did I then have in my bank account altogether ?

9. For each of the following, calculate how much the savings would be worth **in total** at the end of 1 year :-

a Sally invested £4 000. Annual Interest Rate = 5% p.a.

b Nadine invested £800. Annual Interest Rate = 3% p.a.

c Stewart invested £2 200. Annual Interest Rate = 2·8% p.a.

d Ralph invested £17 500. Annual Interest Rate = 6·1% p.a.

10. Karen had £7 000 and decided to invest it with "Morden Building Society".

a What **rate** of interest would she expect (2·3%, 2·9% or 3·2%) ?

b Calculate how much **interest** Karen would receive after 1 year.

MORDEN BUILDING SOCIETY

"The more you bank – The higher the rate"

up to £1000	-	2·3%
£1000 - £10 000	-	2·9%
over £10 000	-	3·2%

11. Decide what **rate** of interest each of the following is due with Morden Building Society and calculate the amount of interest due after 1 year :-

a Nell has £700 to invest for 1 year.

b Naomi has £11 000 to invest for 1 year.

c Jeniffer has £4 500 to invest for 1 year.

d Andrew has £24 000 to invest for 1 year.

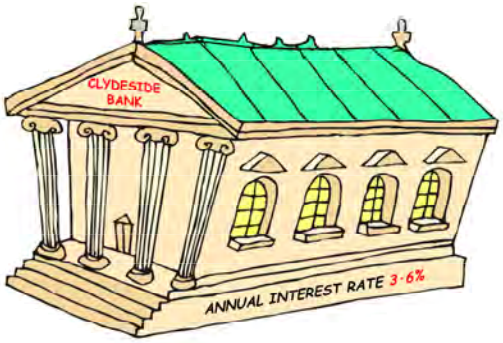
12. William decides to invest £3 000 with "Western Building Society".

a How much interest should he expect if he leaves his money for 1 year ?

b How much does this work out at for 1 month ?

c How much interest is he due if he withdraws his savings after 8 months ?

13.



a If I left £4 000 with "Clydeside Bank" for 1 year, how much interest would I receive ? (*Annual rate = 3·6%*).

b If I withdrew my money after 1 **month**, how much interest would I receive ?

c I decided to leave my money for 5 months.

Calculate the amount of interest I should get.

14. For each of the following :-

(i) calculate the interest for 1 year.

(ii) then calculate the interest for 1 month.

(iii) finally calculate the interest for the length of time the money was actually invested.

a Felicity invested £6 000 at an annual rate of 4%.

She withdrew her savings after 3 months.

b Alison invested £720 at an annual rate of 2·5%.

She withdrew her savings after 8 months.

c Denise invested £8 400 at an annual rate of 4·3%.

She withdrew her savings after 6 months.

d Andrea invested £120 000 at an annual rate of 5·5%.

She withdrew her savings after 10 months.

15.

David withdrew £15 000 from his bank and opened up a new account with the "Lyceum".

a Calculate how much interest he could expect if he left his money there for 1 year.

b David withdrew his money after 8 months.

Calculate how much interest he received.

c What was the total value of David's savings after withdrawing his money ?

Simple Bills & VAT

Bob The Grocers

onions  18p/kg	milk  51p/pint	sliced ham  80p/$\frac{1}{4}$ kg	apples  £1·40/kg	cucumber  60p each	bananas  76p/kg
eggs  £1·42 for six	carrots  90p/kg	potatoes  78p/kg	parsnip  £1·50/kg	strawberries  £4·40/kg	pumpkin  £1·10/kg
oranges  £2·30/kg	lemons  £1·80/kg	peaches  £2·40/kg	cherries  £5·20/kg	cheese  £6·20/kg	roast chicken  £4·80/kg

Exercise 2

(No calculator here).

1. Neatly copy each of the following bills and calculate the **total** each time :-

a

1 kg potatoes –
1 kg onions –
2 pts of milk –

b

$\frac{1}{2}$ cucumber –
2 kg bananas –
3 kg carrots –

c

4 kg apples –
12 eggs –
3 kg oranges –

d

3 kg carrots –
$\frac{1}{2}$ kg parsnip –
1 kg cheese –

e

$\frac{1}{2}$ kg strawberries –
$\frac{1}{2}$ kg cherries –
$\frac{1}{2}$ kg sliced ham –

f

2 kg oranges –
$\frac{1}{2}$ pumpkin –
3 pts of milk –

g

2 cucumbers –
6 kg onions –
3 kg carrots –
4 kg potatoes –

h

2 pts milk –
6 kg bananas –
3 eggs –
$\frac{3}{4}$ kg roast chicken –

i

2 kg apples –
$1\frac{1}{2}$ kg oranges –
2 kg bananas
$1\frac{1}{2}$ kg peaches –

j

4 kg onions –
$1\frac{1}{2}$ cucumbers –
$\frac{1}{2}$ kg carrots –
3 kg apples –

k

1 dozen eggs –
$\frac{3}{4}$ kg sliced ham –
1 pint of milk –
$1\frac{1}{2}$ kg parsnip –

l

$1\frac{1}{2}$ kg cherries –
2 kg peaches –
3 kg oranges
$2\frac{1}{2}$ kg bananas –

2. **Copy** this garage bill, calculate the **VAT** (at **20%**) and the **Final Bill**.

THOMSON'S GARAGE

Parts	-	£86·70
Labour	-	£43·30
Sub Total		£
+ VAT (20%)		£ ← (20 ÷ 100 × ....)
Final Bill		£

3. For each of the following, **copy** the bill and calculate the **VAT** and the **total bill** :-

a

FURNITURE RENOVATORS

Material	=	£235·70
Labour	=	£320·30
Sub Total	=	
+ VAT (20%)	=	
Total Bill		

b

P.C. REPAIRS

Parts	=	£37·85
Labour (4 hrs at £17·50)	=	£
Sub Total	=	
+ VAT (20%)	=	
Total Bill		

c

PICASSO PAINTERS

Wallpaper	=	£43·50
Paint	=	£18·75
Paste	=	£ 3·60
Labour (8 hrs at £12·50)	=	£
Sub Total	=	
+ VAT (20%)	=	
Total Bill		

d

TERRY'S T.V. REPAIRS

Parts	=	£26·40
Labour	=	£32·60
Sub Total	=	
+ VAT (20%)	=	
Total Bill		

e

THE LANDSCAPE GARDENERS

Plants	=	£34·50
Compost	=	£18·25
Labour (6 hrs at £9·75)	=	£
Sub Total	=	
+ VAT (20%)	=	
Total Bill		

f

THE CAR BODY SHOP

New Wing	=	£48·60
Panel	=	£17·25
Labour (3 hrs at £11·40)	=	£
Sub Total	=	
+ VAT (20%)	=	
Total Bill		

4. Calculate the cost of **each** of the following items :-

a	20 metres of heavy duty chain at £3·20/metre.	(+ VAT) at 20%)
b	A computer (£575) plus printer (£185). 	(+ VAT) " "
c	4 new tyres at £47·85 each.	(+ VAT) " "
d	A T.V. (£325·50) plus video recorder (£169·50).	(+ VAT) " "
e	Hire of a van for 8 hours at £8·75/hour. 	(+ VAT) " "
f	7 hours of a gardener's time at £7·80/hour.	(+ VAT) " "
g	A C.D. Burner (£235) plus £5 delivery charge.	(+ VAT) " "

Electricity Bills

Exercise 3

1. Study this Electricity Bill.

SOUTH WEST SCOTLAND ELECTRICITY BOARD (SWSEB)	
Householder :- Mr J Riddle	**Period** :- Jan 15th – Mar 15th (2013)
Units Present Reading :- 02931 Previous Reading :- 02271 **Units** used :- ???	**Charges** ??? units at 13·4p/unit = £ + VAT (5%) = £ **Amount** due = £

a By subtracting 2271 from 2931, calculate how many units of electricity have been used from January to March.

b By multiplying this number of units by 13·4p, calculate :-

(i) the cost of the units **in pence**.

(ii) the cost of the units **in £'s**. (*Divide by 100*).

c Calculate the VAT due (at 5%, **not** 20%).

d Calculate the final bill sent to Mr Riddle.

2. Neatly copy out this bill and calculate the final amount due.

SOUTH WEST SCOTLAND ELECTRICITY BOARD (SWSEB)	
Householder :- Mr B Spice	**Period** :- March 15th – May 15th
Units Present Reading :- 08134 Previous Reading :- 06914 **Units** used :- ???	**Charges** ??? units at 13·4p/unit = £ + VAT (5%) = £ **Amount** due = £

3. You do NOT have to copy each of the following bills.

In each case, calculate :-

— the number of units used

— the cost of the units (*in £'s*)

— the VAT (*at 5%*)

— the final amount due.

a

BORDERS ELECTRICITY BOARD (BEB)	
Householder :- Mr J Blunt	**Period** :- June 13th – Aug 13th
Units Present Reading :- 08321 Previous Reading :- 07461 **Units** used :-	**Charges** units at 14·1p/unit = £ + VAT (5%) = £ **Amount** due = £

b

NORTHERN ELECTRICITY BOARD (NEB)	
Householder :- Mr A Bloggs	**Period** :- Sept 15th – Nov 15th
Units Present Reading :- 05931 Previous Reading :- 05376 **Units** used :-	**Charges** units at 16·2p/unit = £ + VAT (5%) = £ **Amount** due = £

3. **c**

CENTRAL POWER ELECTRICITY BOARD (CPEB)	
Householder :- Mr J Doe	**Period** :- Mar 30th – May 30th
Units Present Reading :- 10571 Previous Reading :- 09861 **Units** used :- ☐	**Charges** ☐ units at 15·8p/unit = £ + VAT (5%) = £ **Amount** due = £ ☐

d

HIGHLAND ELECTRICITY BOARD (HEB)	
Householder :- Mrs M Thatcher	**Period** :- May 14th – Jul 14th
Units Present Reading :- 21745 Previous Reading :- 20863 **Units** used :- ☐	**Charges** ☐ units at 17·5p/unit = £ + VAT (5%) = £ **Amount** due = £ ☐

e

CENTRAL POWER ELECTRICITY BOARD (CPEB)	
Householder :- Mr T Blair	**Period** :- Jan 30th – Mar 30th
Units Present Reading :- 17937 Previous Reading :- 16921 **Units** used :- ☐	**Charges** ☐ units at 15·8p/unit = £ + VAT (5%) = £ **Amount** due = £ ☐

f

HIGHLAND ELECTRICITY BOARD (HEB)	
Householder :- Mr D Dan	**Period** :- May 14th – Jul 14th
Units Present Reading :- 09437 Previous Reading :- 08667 **Units** used :- ☐	**Charges** ☐ units at 17·5p/unit = £ + VAT (5%) = £ **Amount** due = £ ☐

What Have I Learned ?

1. Give one reason why you should deposit any large sum of money you have in a bank or building society, rather than put it in a box under your bed.

2. Scotia Bank pays an annual rate of interest of 4%.

   David puts his life savings of £18 000 into Scotia and leaves it there for 1 year.

   a Calculate how much **interest** David will receive.

   b How much will David's savings then be worth ?

3. Melanie has been left £2 400 by her Gran.

   She decides to put it into the Scotia Bank for 1 year.

   a How much **interest** should she expect at the end of the year ?

   b If she withdrew her money after 1 month, how much interest should she receive ?

   c In fact, Melanie lifts the money from her account after **9 months**.

   How much **interest** will the bank have to pay to Melanie ?

4. VAT is generally charged at 20%. How much VAT would you expect to pay when you buy an iMac computer priced £1180 ?

5. Mike had a car accident and put his car in for an estimate with THE BODY PANEL SHOP.

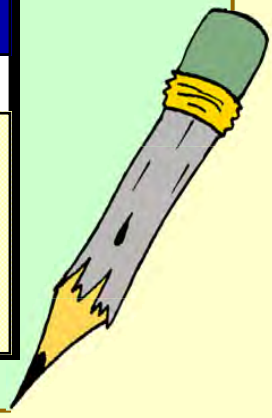
   Make a copy of the estimate and calculate the **total** estimated bill for repairing Mike's car.

THE BODY PANEL SHOP		
New Bonnet	=	£64·50
Front Bumper	=	£47·90
Labour (4 hrs at £10·80)	=	£ ?
Sub Total	=	?
+ VAT (20%)	=	?
Total Bill		?

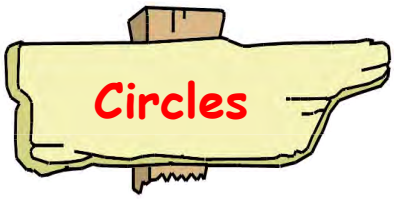
6. Mr LaRue's electricity bill arrived for the period June to September.

   Copy this bill out neatly and calculate the final amount due.

HIGHLAND POWER ELECTRICITY BOARD (HPEB)	
Householder :- Mr D LaRue	**Period** :- Jun 28th – Sep 27th)
Units Present Reading :- 29848 Previous Reading :- 29032 **Units** used :- ☐	**Charges** ☐ units at 13·7p/unit = + VAT (5%) = **Amount** due = ☐



CHAPTER 9



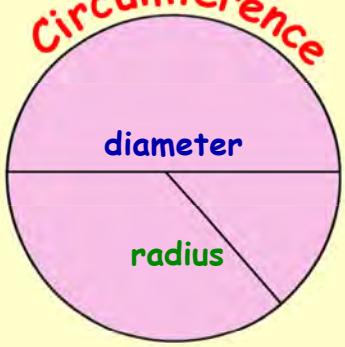
The Parts of a Circle

The curved distance around the edge of a circle is called the **circumference (C) of the circle**.

The line joining two points on the circumference passing through the centre is the **diameter**.

The shorter line joining the centre of the circle to the circumference is the **radius**.

The **diameter** is always twice the **radius**.



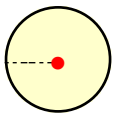
Exercise 1

(*You will need a* ***ruler*** *and a pair of* ***compasses*** *here*).

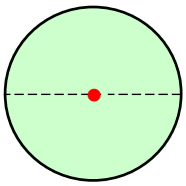
1. **a** Use a pair of compasses to draw a circle with a radius of 4 centimetres.
   b Draw in a diameter and label it **diameter**.
   c Draw in any radius and label it **radius**.
   d Label the **circumference** of your circle.

2. For each of these circles, say whether the dotted line is a **radius** or a **diameter** :-

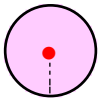
a



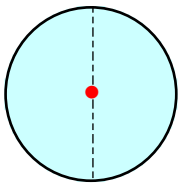
b



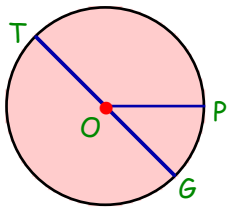
c



d



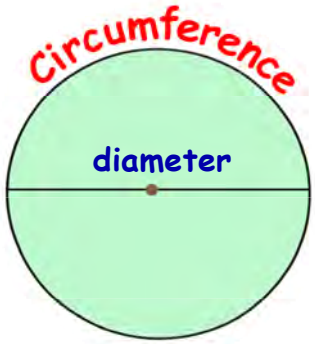
3. **a** Use two letters to name the line which is a **diameter** in this circle.
   b Name a **radius** in the figure.



4. **a** Draw a circle with a radius of 4 centimetres. Put a point (O) at its centre.
   b Draw a **radius** OA on your circle and label the point A.
   c Draw any **diameter** DE on your circle and label the points D and E.
   d Measure the length of DE and show it is twice the length of **radius** AO.

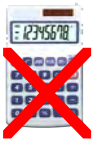
5. **a** If the **radius** of a circle is 7 centimetres, what is the length of its diameter ?
   b If the **diameter** of a circle is 20 centimetres, what is the length of its **radius** ?
   c If the **diameter** of a circle is 31 centimetres, what is its **radius** ?
   d If the **radius** of a circle is 4·3 centimetres, what length is its diameter ?

The Circumference (C) of a Circle

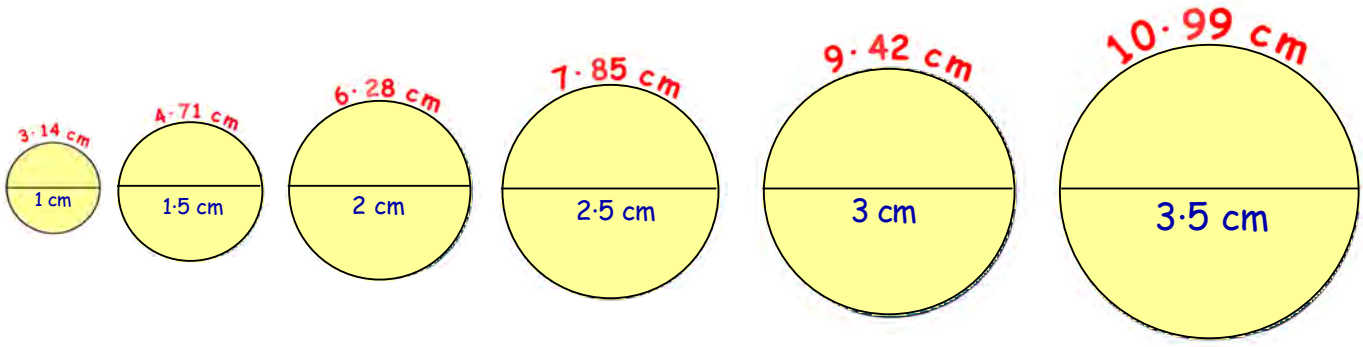


A long time ago it was discovered that there was a connection between the length of the **diameter** of a circle and the length of its **circumference**.

Practical Exercise



1. Shown below are drawings of circles with their **diameters** and **circumferences** given.



a Copy this table and fill in the **first two rows** :-

diameter (*D*)	1	1·5	2	2·5	3	3·5
circumference (*C*)	3·14	4·71	6·28	?	?	?
C ÷ *D*	3·14	?	?	?	?	?

b Use your calculator to **divide** the circumference of each circle by its diameter.

Fill in the **third row** of your table.

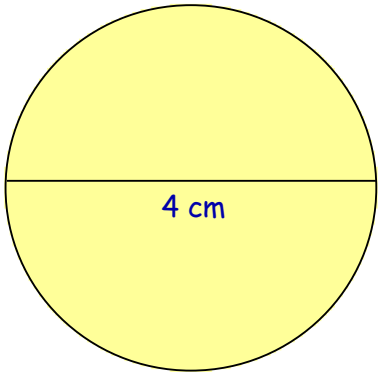
c What answer did you obtain each time ?

2. You may like to measure the diameters of a half dozen circular objects like tin lids.

You could also measure their circumferences using a measuring tape or a piece of string. (*check with your teacher*).

If you have made your measurements accurately, you should check to see that when you divide the circumference of each circle by its diameter, you obtain the same answer as that discovered in question number 1.

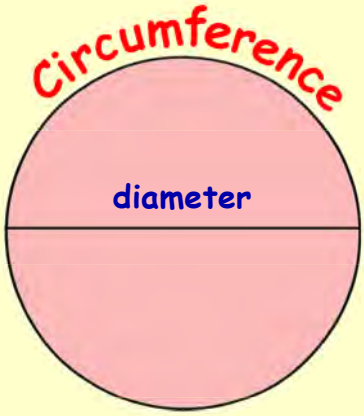
3. (**Difficult**) If the pattern in question 1 continues, can you guess what the **circumference** of this circle with diameter 4 centimetres might be ?



C = ?

The Circumference (C) of a Circle - A Formula

It has been known for a long time that when you divide the **circumference** of a circle by its **diameter** you always get the answer 3·14...



$$\Rightarrow \quad \frac{C}{D} = 3 \cdot 14...$$

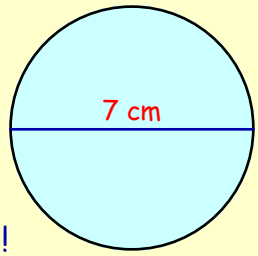
This number (3·14...) is so famous in mathematics, it is given a name. It is called π (*pi* - pronounced "**pie**")

$$\Rightarrow \quad \frac{C}{D} = \pi \qquad \text{(where } \pi = 3 \cdot 14..\text{)}$$

We can use the rearrangement of this to help us calculate the circumference of a circle as long as we know what its diameter is.

$$\Rightarrow \quad C = \pi \times D \qquad \text{(or } C = \pi D \text{ for short).}$$

Example :- Calculate the **circumference** of this circle which has a diameter of 7 centimetres :-



$\Rightarrow \quad C = \pi D$

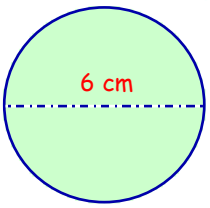
$\Rightarrow \quad C = 3 \cdot 14 \times 7 \text{ cm}$

$\Rightarrow \quad C = 21 \cdot 98 \text{ cm}$ it's as simple as that !

Exercise 2

(*In this exercise, use 3·14 as an estimate for* π).

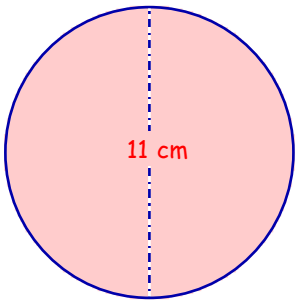
1. Calculate the **circumference** of this circle with a diameter of 6 cm. (*Copy this working*).



$C = \pi D$

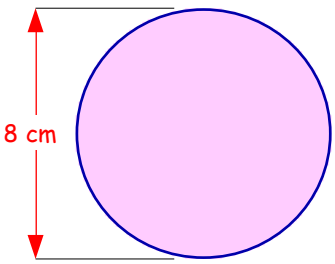
$\Rightarrow \quad C = 3 \cdot 14 \times 6 \text{ cm}$

$\Rightarrow \quad C = \ldots \text{ cm}$

2. 

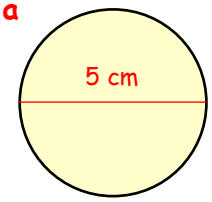
Calculate the **circumference** of the circle with diameter 11 centimetres. (*Show 3 lines of working*).

3. Calculate the **circumference** of this circle :-

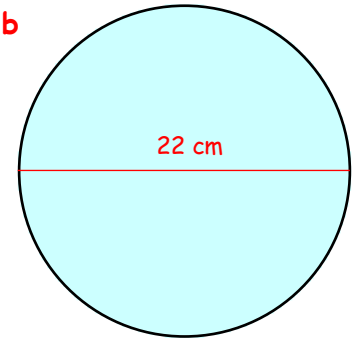


4. For each of these circles, set down the three lines of working and calculate the lengths of their circumferences :-

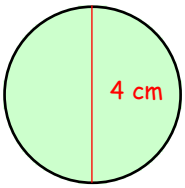
a



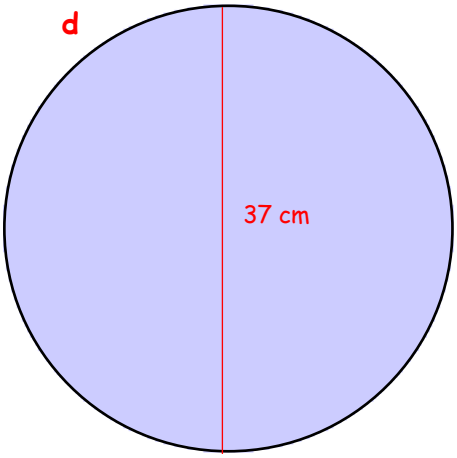
b



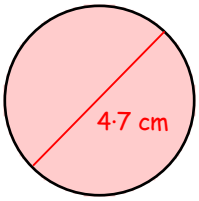
c



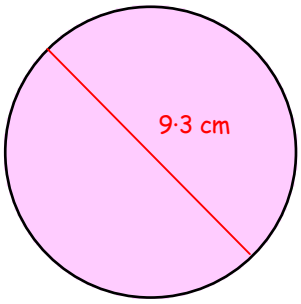
d



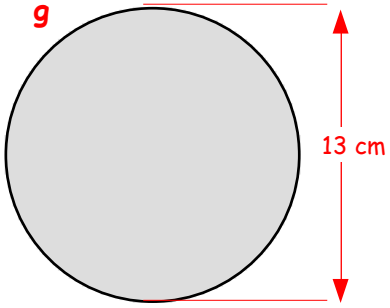
e



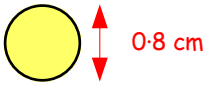
f



g



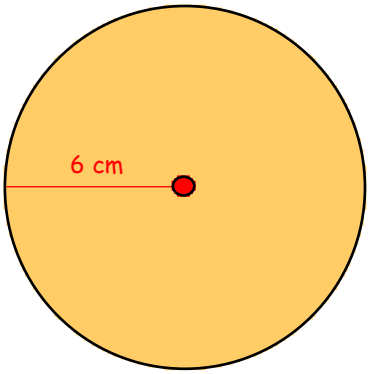
h



5. **Be careful here** !!

This time you are told that the **radius** is 6 centimetres.

To calculate the circumference, you have to find the length of the **diameter** first.



radius = 6 cm => **diameter** = 2 x 6 = **12 cm**

Now we can proceed

$C = \pi D$

=> $C = 3{\cdot}14 \times$ **12 cm**

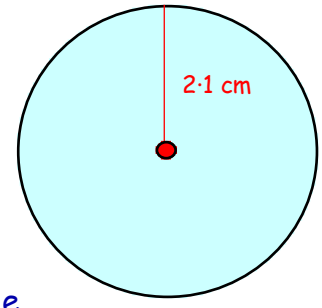
=> $C =$ .... cm

note

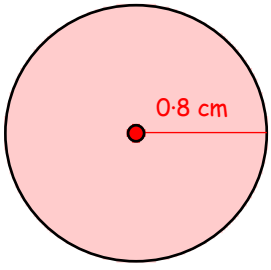
6. For this circle :-

a Double the radius to get the diameter.

b Use the diameter to calculate the circumference.

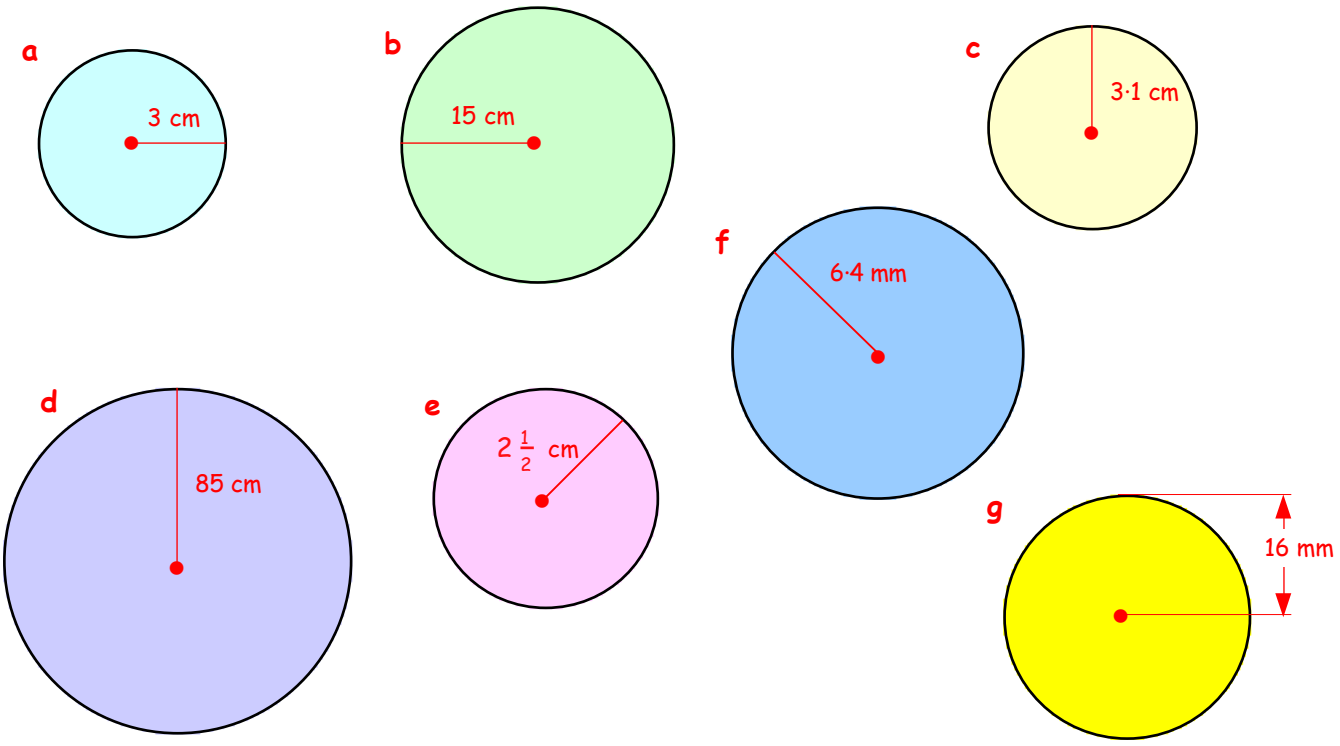


7.

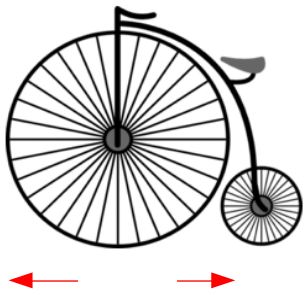


Calculate the circumference of this circle.

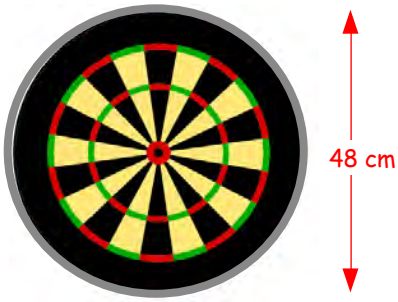
8. Calculate the diameter, then the circumference of each of these circles :-



9. Calculate the circumference of the large bicycle wheel.



10.

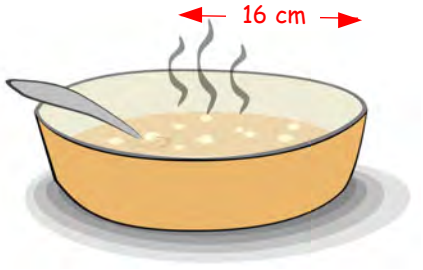


Calculate the length of the metal strip used to bind the edge of this dart board.

11. The **radius** of this Mr Happy face is 18 centimetres.

Calculate the circumference of the face.

12.

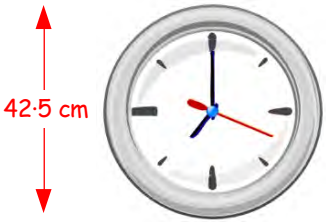


The radius of the top of this large soup bowl is 16 centimetres.

Calculate its circumference.

13. This wall clock has a diameter of 42·5 centimetres.

Calculate the circumference of the clock.



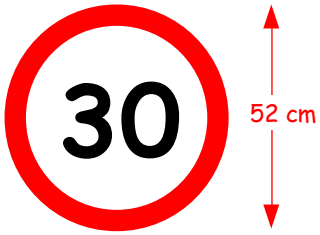
14.

This circular window has a **radius** of 22 centimetres.

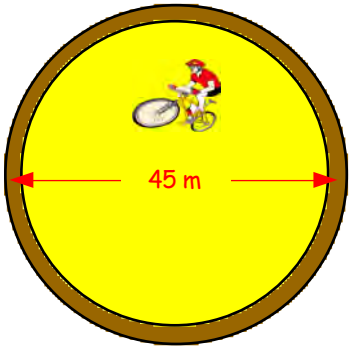
Calculate the circumference of the window.

15. This road sign has a diameter of 52 centimetres.

Calculate the circumference.



16.



Shown is a circular cycle race track.

The diameter of the track is 45 metres.

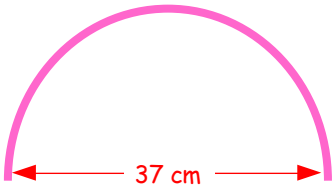
a Calculate the distance round one lap of the track.

b A cyclist goes around the track 25 times during a race. How far has he cycled altogether ?

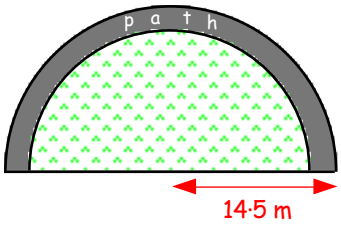
17. A piece of steel bar is bent into the shape of a **semi-circle** (a half circle).

The diameter of the semi-circle is 37 centimetres.

Calculate the length of the metal bar.



18.



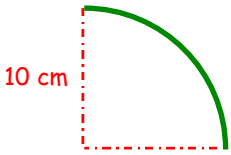
The path around a garden is in the shape of a semi-circle.

The radius of the semi-circle is 14·5 metres.

Calculate the length of the path.

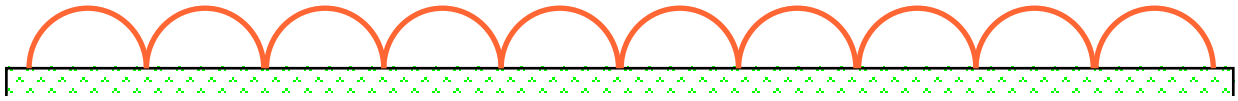
19. The diagram shows a quarter circle with radius 10 centimetres.

Calculate the length of the curved part of the shape.



20. A garden is edged with 10 semi-circular pieces of plastic wire as shown.

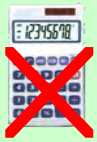
The **diameter** of each semi-circle is 27 centimetres.



a Calculate the length of one of the semi-circular loops.

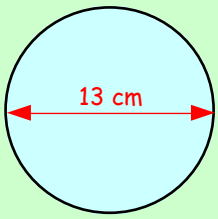
b Calculate the total length of plastic wire required for all the loops.

What Have I Learned ?



1. The diameter of this circle is 13 centimetres.

Write down the length of its **radius**.

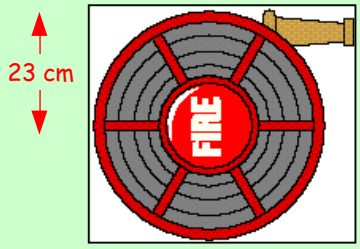


2. I can picture a circle in my head. It has a radius of 4·2 centimetres.

What must its **diameter** be ?

3. Calculate the **circumference** of this CD.

4.



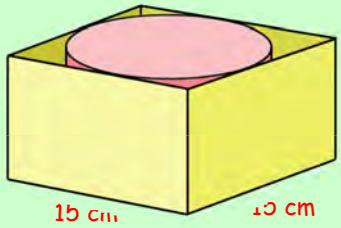
The **radius** of the fire hose holder is 23 centimetres.

Calculate the circumference of the hose holder.

5. This circular biscuit tin just fits inside this square box of side 15 centimetres.

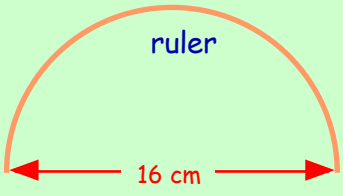
a Write down the diameter of the tin.

b Calculate the circumference of the tin.



6. A boy bends his plastic ruler into this semi-circular shape.

Calculate the length of the ruler.



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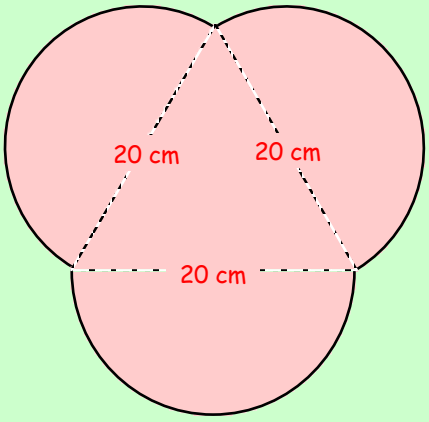
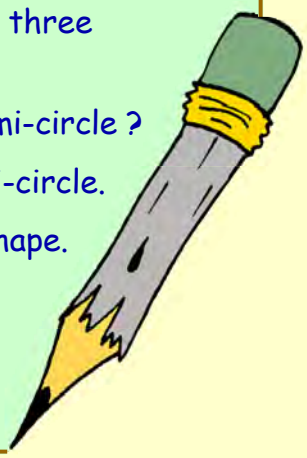


Shown is an equilateral triangle with three semi-circles, one drawn on each side.

a What is the diameter of each semi-circle ?

b Calculate the length of each semi-circle.

c Calculate the **perimeter** of the shape.
(*The distance round the outside*).



CHAPTER 10

Time/Distance/ Speed 1

12 & 24 hour Time

Remember :- 12 hour time —> 24 hour time
24 hour time —> 12 hour time

Example :- 6·30 am —> 0630 4·40 pm —> 1640

Exercise 1

1. Change the following 12 hour clock times to **24 hour clock times** :-

a	3·30 am	b	1·45 am	c	4 am
d	1·30 pm	e	3·15 pm	f	5 pm
g	5·15 am	h	8·40 pm	i	2·45 am
j	7·25 am	k	midday		
l	12·50 am	m	12·50 pm		
n	9·30 pm	o	3·55 am		
p	8·10 pm	q	10·55 pm		
r	9·35 am	s	11·20 pm		
t	10·32 am	u	9·50 pm.		

0430 —> 4·30 am 2145 —> 9·45 pm

2. Change the following 24 hour clock times to **12 hour clock times** :-

a	0130	b	1120	c	0905
d	1330	e	1540	f	2215
g	0250	h	1935	i	1810
j	1601	k	1200		
l	0830	m	0550		
n	1420	o	2305		
p	1955	q	0030		
r	0735	s	1135		
t	2020	u	2355.		

Time Intervals, Timetables, Programme Guides

Exercise 2

1. How long is it from :-

a 4·15 pm to 7·15 pm

b 7 am to 10·30 am

c noon to 5·30 pm

d 6·30 pm to 10·15 pm

e 4·45 am to 6·20 am

f 2·20 am to 10·15 am

g 0620 to 0825

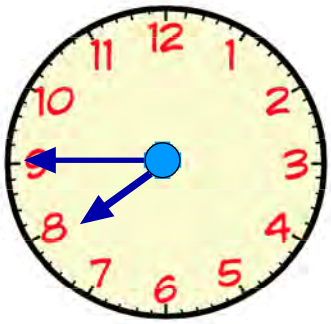
h 1945 to 2010

i 1715 to 1905

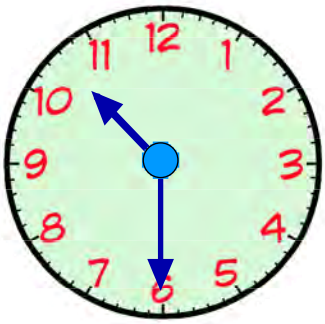
j 2310 to 0100 (*next day*) ?

2. The clocks indicate the start and finish of a concert one evening.

For how long did the concert last ?



Begins



Ends

3. Shown is part of the train timetable from Kyle to Renton.

	Kyle →	*Cairns* →	*Colford* →	*Duns* →	*Renton*
Early Train	7·15 am	8·20 am	10·30 am	11·15 am	1·50 pm
Late Train	11·30 am	12·35 am			6·05 pm

a How long does the early train take to travel from :-

(i) Kyle to Cairns ?

(ii) Colford to Duns ?

(iii) Kyle to Renton ?

b Assuming that the late train travels at the same speed as the early train, when would it be expected to arrive at :-

(i) Colford ? (*Hint ! Notice how long the early train takes from Cairns to Colford*).

(ii) Duns ?

4. Here are the bus timetables for **"Stirling <—> John O'Groats"**.

Stirling <—> John O'Groats			
Stirling	leave	0955	2300
Perth	arrive	1050	2355
	leave	1050	midnight
Dunkeld	arrive	1120	0025
Pitlochry	arrive	noon	0105
	leave	1310	0120
Kingussie		1430	0240
Carrbridge		1508	0310
Inverness	arrive	1558	0405
	leave	1640	0405
John O'Groats	arrive	1800	0530

John O'Groats <—> Stirling			
John O'Groats	leave	1000	2200
Inverness		1140	2340
Carrbridge		1232	0032
Kingussie	arrive	1300	0105
	leave	1345	0110
Pitlochry		1425	0150
Dunkeld	arrive	1455	0220
	leave	1505	0220
Perth	arrive	1532	0251
	leave	1532	0315
Stirling	arrive	1610	0440

a How long does it take from Inverness to John O'Groats on each of the 0955 and the 2300 services from Stirling ?

b At what times do the buses leave Kingussie for Pitlochry ? (*Answer using a.m. or p.m.*).

c Where will you have time for lunch on **each** of the **day time services** ? How long in each case ?

d On the **night time services** – where will you have time for a comfort stop and for how long in each case ?

e Which of the two evening service takes longer and by how much ?

f If you dislike travelling by bus, but had to undertake a journey from John O'Groats to Stirling, which bus would you choose to take and why ?

5. A plane leaves Edinburgh Airport at 2340 on Wednesday.

It touches down in Tenerife at 0410 (*British time*) on Thursday.

How long did the flight take ?

6. British Airways flight BA447 left Gatwick Airport at 10·25 pm on Monday and arrived in New York at 5·10 pm (British time) on Tuesday morning.

a How long did the flight take ?

b New York is 5 hours **behind** Britain.

What time (New York time) was it really when the plane touched down ?

7. Shown is an old T.V. programme listings. Use it to answer the following :-

BBC1

DAWN FRENCH: 9.00pm

6.00 **Breakfast** (T) 776062
9.00 **Kilroy** (T) 8715333
10.15 **City Hospital** (T) 5877791
11.00 **Big Strong Boys** (R) (T) 2284
11.30 **Real Rooms** (T) 3913
12.00 **Call My Bluff** (T) 55888
12.30 **Passport to the Sun** (T) 74401
1.00 **BBC News; Weather** (T) 48159
1.30 **Regional News; Weather** 63631028
1.45 **Neighbours** See 5.35pm for details (T) 51893468
2.10 **Diagnosis Murder** An arson attack ends in death (R) (T) 6923975
2.55 **Dragan Sgeul (Dragon Tales)** Fire-breathing fun for kids 5475371
CHILDREN'S
3.25 **Tweenies Songtime** (T) 3796081 **3.26 Tweenies** (T) 5956197 **3.45 Rugrats** (R) (T) 8610062 **3.55 SMart on the Road** (T) 6812062 **4.10 The Wild Thornberrys** (R) (T) 7803994 **4.35 The Next Big Thing** (T) 2831420 **5.00 Blue Peter** (T) 5099468 **5.20 Newsround Extra** (T) 7729352
5.35 **Neighbours** It's Toadie's last day at Stewart, Whitehead and Moore, and Flick is fed up with Matt's obsession with cars (R) (T) 763081

BBC2

6.00 **OU** 72468
CHILDREN'S
7.00 **Potsworth and Co** (R) (T) 1062994 **7.20 Arthur** (R) (T) 1854710 **7.45 Captain Abercromby** 2543888 **8.00 Pocket Dragon Adventures** (R) (T) 2911081 **8.15 Bill and Ben** (R) (T) 5514975 **8.25 Just So Stories** (R) (T) 5538555 **8.35 Postman Pat** (R) (T) 4000028 **8.50 Pingu** (R) 4867197 **9.00 Teletubbies** (R) (T) 9061994 **9.50 Playdays** (R) (T) 2579371 **10.10 Tweenies** 2787053
CHILDREN'S
10.50 **Hands Up!** (T) 2360555 **11.05 Numbertime** (T) 3019517 **11.20 Words and Pictures** (T) 3023710 **11.35 Watch** (T) 7553913 **11.50 Zig Zag** (T) 7530062 **12.10 Landmarks** (T) 4600791
12.30 **Working Lunch** The latest stories from the business world 76541
CHILDREN'S
1.00 **Bill and Ben** (R) (T) 39229401
1.10 **FILM: MOGAMBO** Lumbering jungle romance with Clark Gable. See Movies (T) 60018623
3.05 **Afoot Again in the Past** Gavin Stamp traces the Great Western Railway and Kirsty Wark examines Paddington Station (T) 5943623
3.20 **BBC News; Regional News; Weather** (T) 3786604
3.30 **Esther** The hostess chairs another round of topical debate (T) 25888
4.30 **Ready Steady Cook** Culinary duel in which two celebrity chefs compete to prepare a meal in only 20 minutes (T) 4473449
5.15 **The Weakest Link** Anne Robinson hosts the general knowledge quiz in which contestants answer

SCOTTISH

6.00 **GMTV** Kate Garraway and Eamonn Holmes present the final part of Child Car Seat Safety Week 2823642
9.25 **Trisha** Guests relate their stories in the studio discussion (T) 8660994
10.30 **This Morning** Popstars contestant Warren Stacey performs live and talks about what he's been up to in the last year. Plus Phil Vickery's cookery ideas for the weekend and the regular phone-in slot (T) 14623
12.00 **Family Fortunes** Two families compete for prizes, the £5000 jackpot and a new car (R) (T) 73284
12.30 **ITV News; Weather** (T) 4463791
1.10 **Scotland Today** (T) 51408178
1.40 **Oliver Twist** Fagin's attempt to set Oliver up as a criminal fails when the victim, Mr Brownlow, becomes the boy's benefactor (R) (T) 5707807
2.40 **Passport Quiz** Bryan Burnett asks the questions as three couples vie for a holiday in the sun (T) 5471555
3.10 **ITV News** (T) 3793994
3.15 **Scotland Today** (T) 9188807
CHILDREN'S
3.25 **Dog and Duck** (T) 3772401 **3.35 Kipper** (R) (T) 6836642 **3.45 Little Ghosts** (T) 8605130 **3.55 Cardcaptors** 2510438 **4.20 How 2** (R) (T) 7213826 **4.40 My Parents Are Aliens** (R) (T) 2823401
5.05 **Airline** Katrina anxiously prepares for her first check-up since the cancer operation, and football fever descends on Luton Airport prior to Manchester United's Champions League final (R) (T) 9039517
5.30 **Catchphrase** Nick Weir offers encouragement as contestants try to deduce everyday phrases and

a Which channel was showing the film "**Mogambo**" ?

b How long was the lunchtime showing of "**Neighbours**" ?

c "**GMTV**" lasted for how long ?

d If you had watched "**Passport Quiz**" on Scottish till the end of the programme, then switched to BBC1 for "**Dragan Sgeul**", how much would you have already missed of "**Dragan Sgeul**" ?

e Imagine you had wanted to record "**Real Rooms**", "**Family Fortunes**", "**Working Lunch**", "**Bill & Ben**" and "**Scotland Today**" on a 2 hour DVD.

Would that have been possible ? *Explain* !!

Time, Distance, Speed - Calculating Distance

Example :- A car travels at an average speed of 45 km/hr for 3 hours.

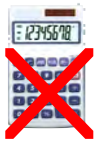
How far will the car travel ?

D = S x T

D = 45 x 3 = **135 km**

Distance = **S**peed x **T**ime

Exercise 3



1. How far, in kilometres, can you travel :-
   - **a** walking at 4 km/hr for 2 hours
   - **b** jogging at 5 km/hr for 4 hours
   - **c** cycling at 9 km/hr for 3 hours
   - **d** driving at 32 km/hr for 5 hours ?

2. Calculate the distance travelled by :-
   - **a** a car, travelling at 48 m.p.h. for 2 hours
   - **b** a train, travelling at 80 m.p.h. for 6 hours
   - **c** a plane, flying at 360 m.p.h. for 4 hours
   - **d** a yacht, sailing at 14 m.p.h. for 3 hours.

3. What distances are covered by the following :-
   - **a** a van, travelling for 30 minutes at an average speed of 50 m.p.h. ?
   - **b** a $1\frac{1}{2}$ hour jog, at an average speed of 8 m.p.h. ?
   - **c** a car journey lasting $2\frac{1}{2}$ hours at an average speed of 40 m.p.h. ?
   - **d** a speed boat ride for 3 hours 30 minutes, at an average speed of 40 km/hr ?
   - **e** a plane journey of 5 hours 30 minutes, at an average speed of 300 m.p.h. ?

4. What distances are covered by the following :-
   - **a** a canoe, going at an average speed of 8 m.p.h. for $\frac{1}{4}$ of an hour ?
   - **b** a lion, going at an average speed of 24 m.p.h. for quarter of an hour ?
   - **c** a boat trip, sailing at an average speed of 12 m.p.h. for 1 hour 15 minutes ?
   - **d** a lorry, travelling at an average speed of 40 km/hr for 45 minutes ($\frac{3}{4}$ hour) ?
   - **e** an athlete, running at an average speed of 12 km/hr for 1 hour 45 minutes ?

5. **a** A plane left Berlin at 8·45 am and arrived at Prestwick at 11·45 am.

The plane flew at an average speed of 320 m.p.h.

How long did the flight take and how many miles did it cover ?

b

A boat left the pier at 2·50 pm and sailed at a steady speed of 16 m.p.h.

How far is the boat from the pier at 4·50 pm ?

c A jogger leaves Tamley Cross at 0830 and heads for Stratham.

She jogs at an average speed of 10 km/hr and arrives at St George's Park in Stratham at 1000.

How far had she travelled ?

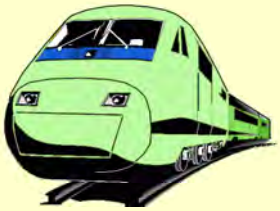
Calculating Speed

Example :- A train travels 200 miles in 4 hours. Find the **average speed** of the train.

S = D / T

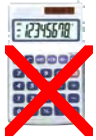
S = 200 ÷ 4

S= **50 mph**

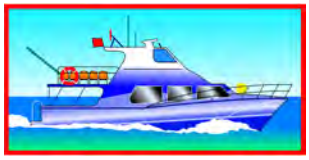


$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

Exercise 4



1. Use the formula to find the average speed of these journeys :-



a 15 miles in 3 hours

b 28 km in 7 hours

c 140 miles in 10 hours

d 350 km in 2 hours.

2. Calculate the average speed of these journeys (watch the units) :-

a 30 km in 2 hours

b 400 miles in 8 hours

c 200 metres in 10 seconds

d 30 km in 4 hours

e 42 000 miles in 7 hours

f 210 000 km in 3 hours.

3. Calculate the average speed of these journeys (in miles per hour) :-

a A ship sails 420 miles in only 7 hours

b A plane flies 6000 miles in 8 hours

c A train travels 273 miles in 3 hours

d A marathon runner covers 18 miles in 2 hours

e A bus travels 549 miles in 9 hours.

4. Find these average speeds :-

a a lorry travelling 78 miles in 2 hours

b a car travelling 15 miles in 30 minutes
(*How far does it travel in 1 hour ?*)

c a boat sailing 9 miles in $\frac{1}{2}$ hour

d an athlete running 12 miles in 1 hour 30 minutes. (*$1\frac{1}{2}$ hours*).

e a snail crawling $\frac{1}{2}$ metre in $\frac{1}{2}$ hour !

5. Find the average speed of :-

a a runner who averages 2 km in 15 minutes

b a bus which travels 12 miles in $\frac{1}{4}$ hour

c a ferry which sails 18 km in 30 minutes

d a motor cyclist does 60 km in 1 hour 30 minutes ($1\frac{1}{2}$ hrs)

e a plane flying 1000 miles in 2 hours 30 minutes ($2\frac{1}{2}$ hrs).

6. A delivery van leaves Brechin at 0845.

By 1245 it has covered a distance of 240 kilometres.

Calculate the average speed of the van.

7.

A plane left Birmingham Airport at 3·45 pm and flew 300 miles to Glasgow, arriving at 5·15 pm.

a How long did the journey take ?

b What was the plane's average speed ?

8. Two friends hire a rowing boat and go rowing on the loch.

They row to an island, taking two hours to get there, but the return journey takes three hours.

If the island is 6·25 miles from the hiring jetty, calculate the average speed for their round trip.

(*Hint :- speed = total distance ÷ total time*).

Calculating Time

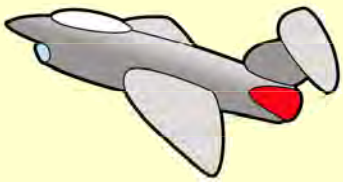
Example :- A jet flies at an average speed of 400 km/hr.

How long will the jet take to travel two thousand kilometres ?

$T = D / S$

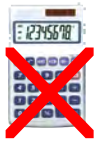
$T = 2000 \div 400$

$T =$ **5 hours**



$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

Exercise 5



1. Change these times into hours and minutes :-

a	$1\frac{1}{2}$ hours	**b**	$3\frac{1}{2}$ hours	**c**	$5\frac{1}{4}$ hours	**d**	$4\frac{3}{4}$ hours
e	$6\frac{1}{2}$ hours	**f**	$8\frac{1}{4}$ hours	**g**	3·5 hours	**h**	2·5 hours
i	4·25 hours	**j**	1·25 hours	**k**	2·75 hours	**l**	0·75 hours.

2. ***2 hours 30 minutes*** *is* ***2·5 hours,*** ***1 hour 15 minutes*** *is* ***1·25 hours***

What are these times in hours :-

a	3 hours 30 minutes	**b**	2 hours 15 minutes
c	5 hours 45 minutes	**d**	1 hour 15 minutes
e	6 hours 30 minutes	**f**	4 hours 30 minutes
g	1 hour 45 minutes	**h**	7 hours 45 minutes ?

3. Use the formula $T = \frac{D}{S}$ to calculate the time taken for each journey here :-

a	walking, 3 km at 3 km/hr	**b**	flying, 3000 miles at 500 mph
c	running, 200 m at 10 m/sec	**d**	driving, 240 km at 30 km/hr
e	crawling, 10 cm at 2 cm/hr	**f**	jogging, 16 miles at 8 mph
g	running at 9 km/hr for 18 km	**h**	driving at 40 m.p.h. for 60 miles.

4. When will these trains arrive at their destinations :-

a **Steam Engine** –

departs 11 am – travels 180 miles at 90 m.p.h. ?

b **Electric Train** –

departs 3·30 pm – travels 105 km at 70 km/hr. ?

c **Diesel Train** –

departs 6·15 am – travels 200 miles at 80 m.p.h. ?

5. How long, **in hours and minutes**, did the following journeys take :-

a a lorry, travelling 45 km at an average speed of 30 km/hr ?

b a coach, travelling 150 miles at an average speed of 60 m.p.h. ?

c a snail, covering 50 centimetres at an average speed of 0·5 cm/sec ? (*answers in minutes and seconds*)

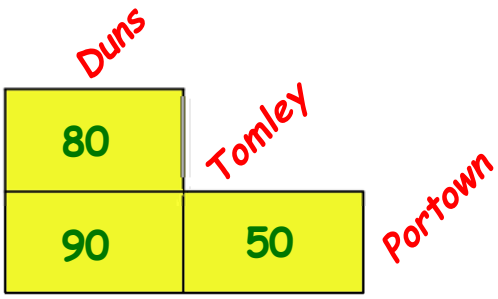
d a bicycle, travelling 40 km at an average speed of 16 km/hr ?

6. Use this **mileage chart** to find the distance between the towns and find how long each of the journeys would take :-

a Duns —> Tomley at 40 m.p.h.

b Tomley —> Portown at 50 m.p.h.

c Duns —> Portown at 60 m.p.h.



7.

A train left Carlisle at 6·45 am.

It travelled the 105 miles to Glasgow at an average speed of 70 m.p.h.

a How long did the journey take ?

b At what time did the train arrive in Glasgow ?

8. An aeroplane left Heathrow at 3·30 pm.

Its destination was an island 2340 miles away.

If it travelled at a steady 520 m.p.h. :-

a How long was the journey ?

b At what time did the plane reach its destination ?

9. The speed of sound is about 340 metres per second.

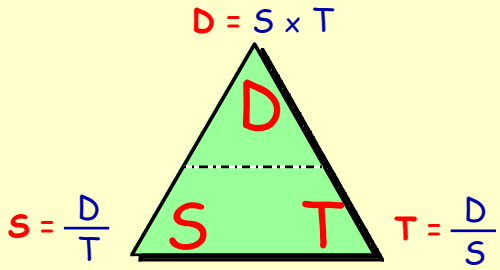
Sally shouts to Harry who is standing 1700 metres away.

How many seconds does it take before Harry hears Sally's voice ?

Time ? Distance ? or Speed ?

Use this **triangle mnemonic*** to help you use the **correct formula** to answer the questions in this exercise.

*A **mnemonic** is anything that helps you remember an important fact.



Exercise 6

1. a

Distance	- 80 miles
Speed	- 20 mph
Time	?

b

Distance	- 200 km
Time	- 8 hours
Speed	?

c

Speed	- 40 mph
Time	- 4 hours
Distance	?

d

Distance	- 120 km
Time	- 3 hours
Speed	?

e

Distance	- 250 miles
Speed	- 100 mph
Time	?

f

Speed	- 4 m/sec
Time	- $2\frac{1}{2}$ seconds
Distance	?

2. A policeman followed a seventeen year old student who drove 55 km in half an hour.

What was the student's average speed ?

3.

A hot air balloon travelled 75 miles at an average speed of 30 miles per hour.

How long did it take to complete its journey ?

4. A small boat, sailing at a steady rate of 18 km/hr, takes $3\frac{1}{2}$ hours to travel from Portree to the mainland.

What is the length of its journey ?

5. A pilot took off from an airfield at 0745 and flew north-east to a meeting point, arriving there at 0945.

If the aircraft travelled 320 miles, what was its **average speed** ?

6.

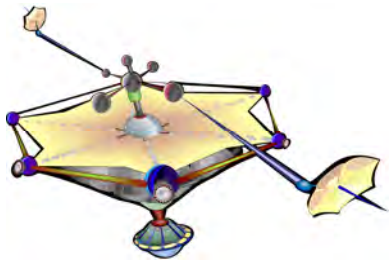
A canoeist travels at an average speed of 8 km/hr.

How long does it take him to canoe a distance of 10 km ?
(*Answer in hours and minutes*).

7. A communications satellite orbits a planet at an average speed of 15 500 mph.

It takes $2\frac{1}{2}$ hours to complete its orbit.

Calculate the **length** of the orbit.



8.

Hazel can walk to school in 30 minutes.

The distance from her house to the school is 2 miles.

a Calculate Hazel's **average speed**.

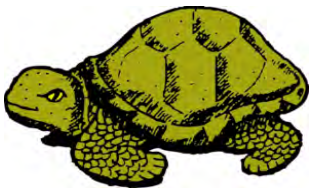
She can cycle twice as fast as she can walk.

b **How long** will it take her to cycle to school ?

9. A bird takes $12\frac{1}{2}$ days to migrate from the U.K. to U.S.A.

If it maintains an average speed of 240 miles per day, what **distance** will it fly to reach America ?

10.



At full speed, a tortoise can travel at 50 centimetres per minute.

How long does it take the tortoise to cross a garden path measuring 3 metres wide ?

11. The police radar trap is set up in a "**30 miles per hour**" stretch of road.

Which of the following drivers might be caught for speeding ?

a John, covering 8 miles in 15 minutes

b Alison, covering 6 miles in 10 minutes

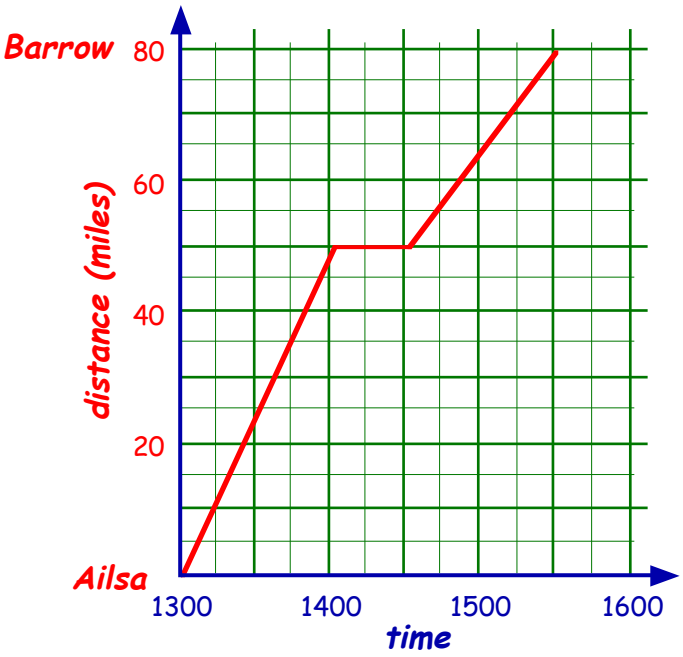
c Bert, covering 10·5 miles in 20 minutes .

Time - Distance Graphs

Exercise 7

1. This graph indicates a lorry driver's journey from Ailsa to Barra which is 80 miles away.

He set off from Ailsa at 1300 along the motorway and stopped for some lunch before completing the rest of his journey along a dual carriageway.



a For how long was he driving on the motorway ?

b For how long did he stop for lunch ?

c At what time did he set off after lunch ?

d When did he arrive in Barrow ?

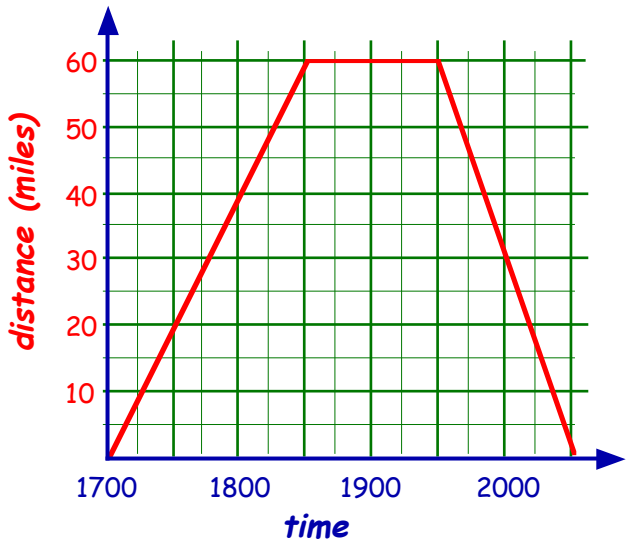
e Calculate the speed of the lorry :-

(i) on the motorway.

(ii) between 1400 and 1430.

(iii) on the dual carriageway.

2. Jill drove from her house to her aunt's and stayed there until it began to get dark. She then drove home via a different route.



a For how long did she stay at her aunt's ?

b Calculate her speed for both the outward and the return journey.

c Which of the two trips do you think might have been done on the motorway ? *Explain.*

3. Jan set off on her scooter at 11 am to travel to Hyde, 30 kilometres away.

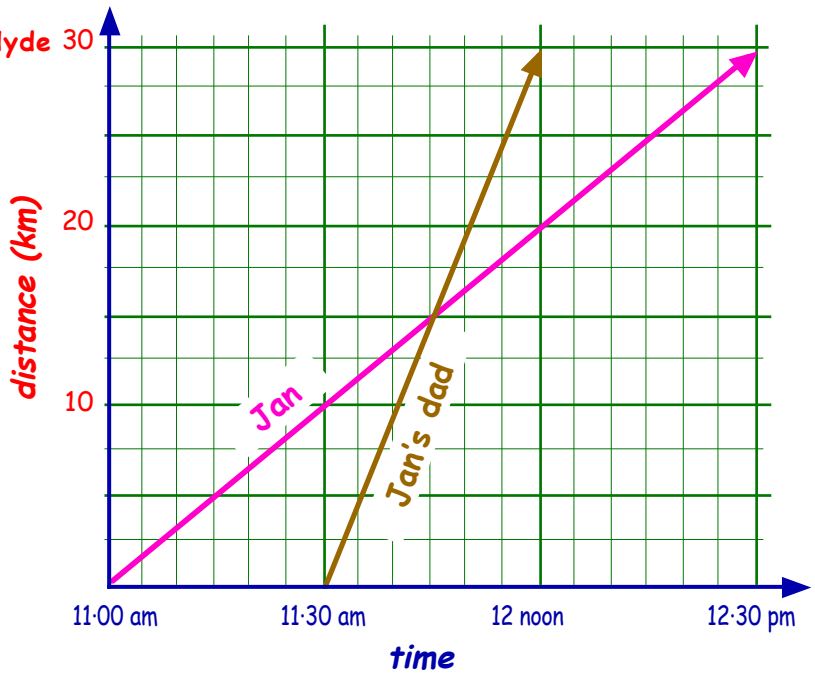
Her dad left their house at 11·30 am and drove to Hyde.

a Calculate Jan's speed.

b Calculate her dad's speed.

c At what time did Jan's dad overtake her ?

d How far away from her home was she when her dad passed her ?



4. "Bob's Stores" have two depots, one at Hayle and the other, 160 kilometres away at Dyce.

Tom sets off from Hayle at 8·00 am, with a load of timber for Dyce.

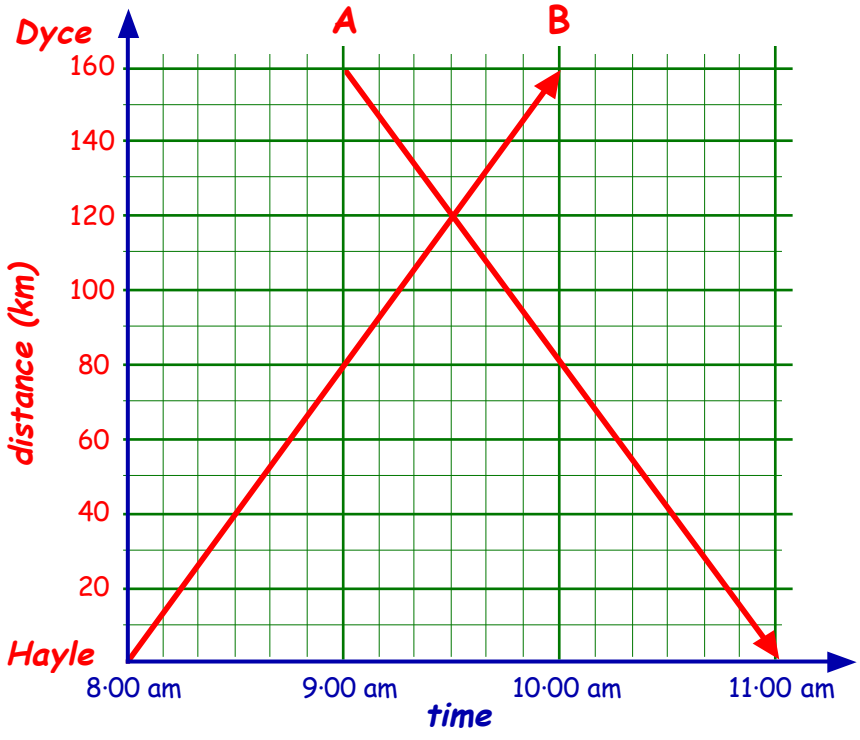
Dan sets off at 9·00 from Dyce, heading for Hayle.

a Which line, A or B, represents Tom's Journey ?

b Calculate :-

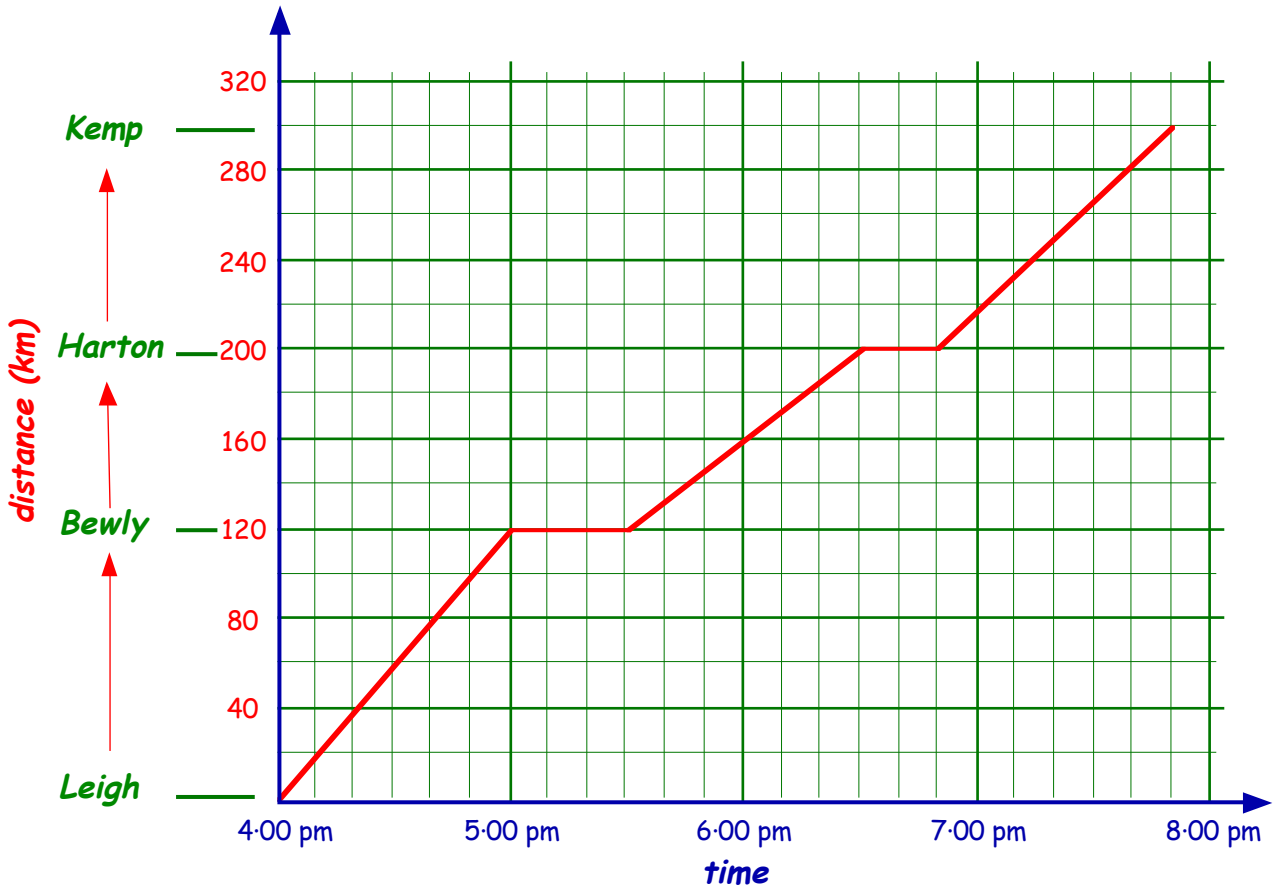
(i) Tom's speed.

(ii) Dan's speed.



c At what time could the two drivers wave to each other ?

5. The graph shows a train journey from Leigh to Kemp.



a Copy and complete this timetable.

Leigh	Bewly		Harton		Kemp
depart	*arrive*	*leave*	*arrive*	*leave*	*arrive*
4·00 pm —>	?	?	?	?	?

b How far is it from :-

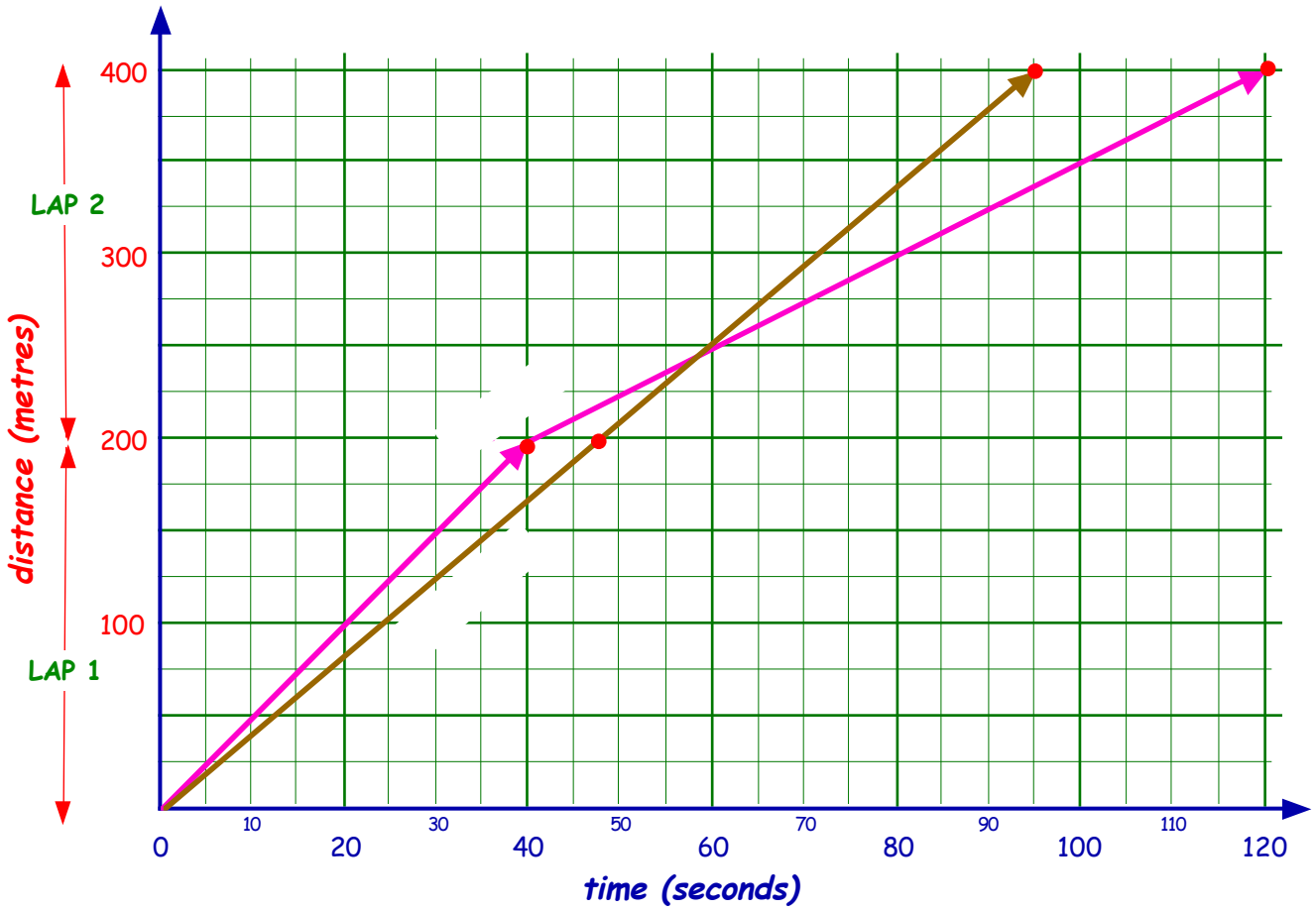
(i) Leigh to Bewly **(ii)** Harton to Kemp ?

c Calculate the average speed of the train :-

(i) from Leigh to Bewly **(ii)** from Bewly to Harton

(iii) from Harton to Kemp **(iv)** from Leigh to Harton.

6. The graph shows how two amateur 400 metre athletes, Spiers and Goodman, paced themselves over the two 200 metre laps.



a Who was the **faster** athlete over the first 200 metres ?

b How long did each runner take to cover the first lap ?

c Who won the 400 metre race ?

d How long did each runner take to complete the 2nd lap ?

e For how many seconds (approximately) was Spiers in the lead ?

f By how many seconds did the winner beat the runner up ?

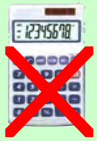
g Calculate Spiers' speed for the first lap in metres per second.

h Calculate his speed for the second lap in metres per second.

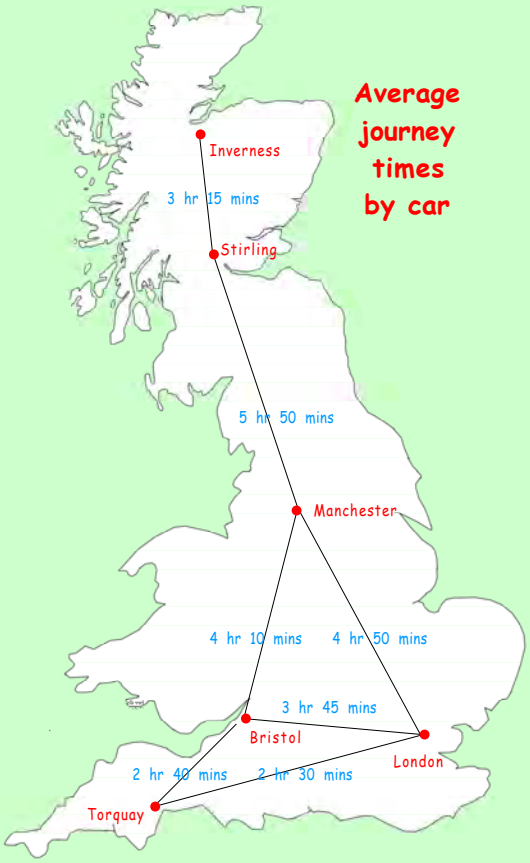
i Calculate Goodman's speed, for the whole race, in metres per second. (*to one decimal place*).

j Who ran the fastest 200 metre lap ?

What Have I Learned ?



1.



Average journey times by car

a How long does it take from :-

(i) Inverness to Manchester ? (via Stirling)

(ii) Stirling to London ? (via Manchester)

(iii) London to Bristol via Torquay ?

b Bob leaves Bristol at 9 am.

He travels to Stirling, going through Manchester.

At what time does he arrive in Stirling ?

c Ann has a meeting in London at 1630.

She leaves her home in Inverness at 0230.

Can she make her meeting in London on time ? *Explain* !

2. A truck leaves Arbroath and travels for 5 hours at an average speed of 46 m.p.h.

How far will the truck have travelled ?

3. Dai travelled the 40 miles from Cardiff to Swansea on the M5 motorway.

He covered the journey in just $\frac{1}{2}$ an hour.

Did Dai break the 70 m.p.h. speed limit ? *Explain*.

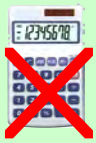
4. A van travelled 210 km in 6 hours.

What was its **average speed**, in km/hr ?

5. Harold flew for 1120 miles at an average speed of 320 m.p.h.

How long did his flight take, in hours and minutes ?

What Have I Learned ?



6. Kim drove for 90 km at an average speed of 60 km/hr.

If she left home at 0845, at what time did she reach her destination ?

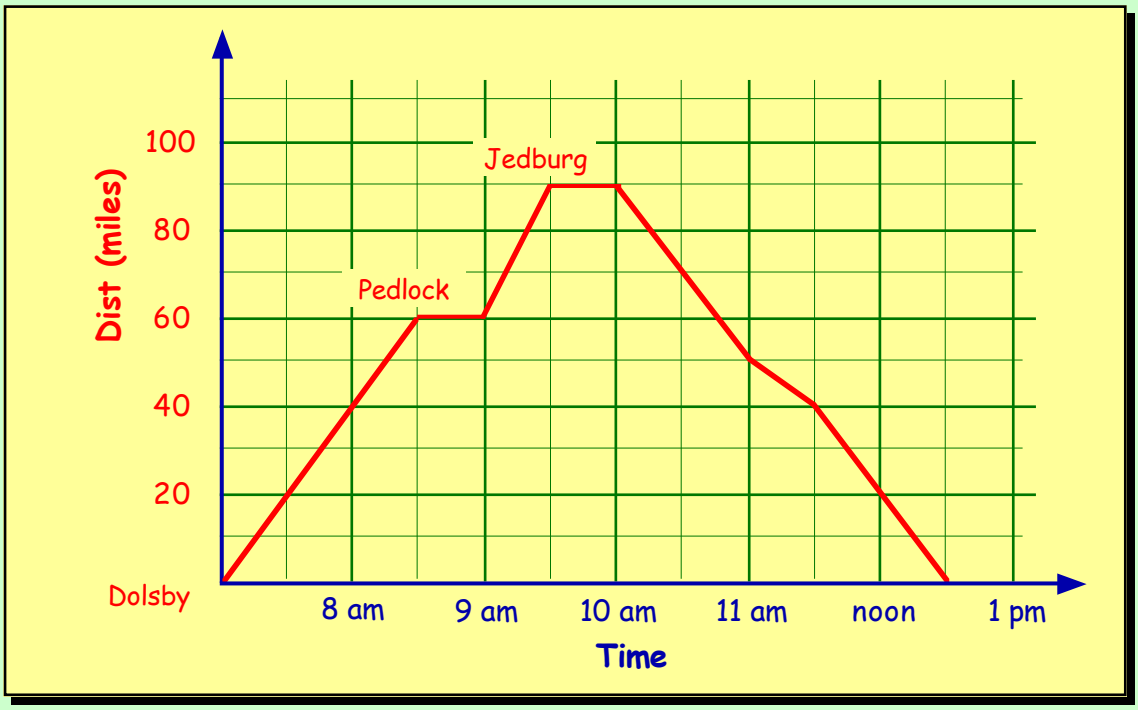
7.

A message in a bottle floats harmlessly on the surface of the ocean at a steady speed of 0·4 kilometres per hour.

It floated for 130 hours before being picked up by a boy on the beach.

How far would it have travelled in that time ?

8. The graph shows a car journey from Dolsby to Jedburg via Pedlock, and back.



a At what time did the journey begin ?

b How far is it from :-

(i) Dolsby to Pedlock **(ii)** Pedlock to Jedburg ?

c How long did it take from Pedlock to Jedburg ?

d How far did the car travel in the last half hour of the trip ?

e Calculate the average speed from Dolsby to Pedlock.

f Calculate the average speed from Jedburg back to Dolsby.

CHAPTER 11

What is a Fraction ?

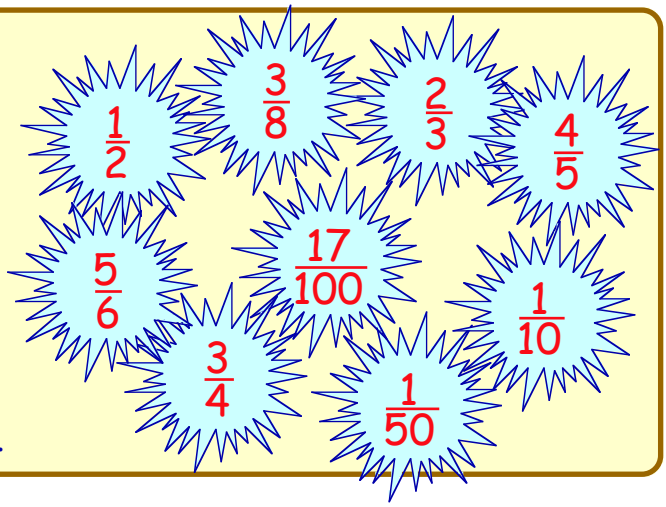
A fraction consists of 2 parts :-

$\frac{3}{4}$ ← this is the **NUMERATOR**

$\frac{3}{4}$ ← this is the **DENOMINATOR**

The **denominator** is the name (or type) of fraction you are dealing with (**quarters** here).

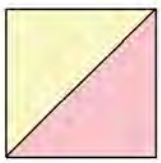
The **numerator** tells you the number or "how many" of the quarters (in this case **three**).

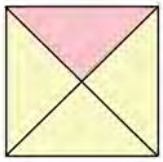


Simplifying Fractions

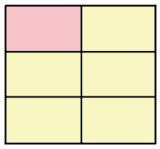
Exercise 1

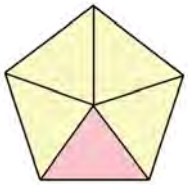
1. For each of the following, say what fraction is pink :-

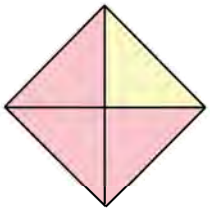
a 

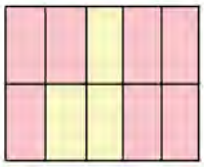
b 

c 

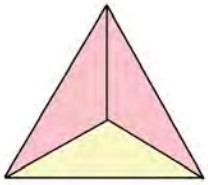
d 

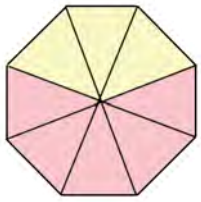
e 

f 

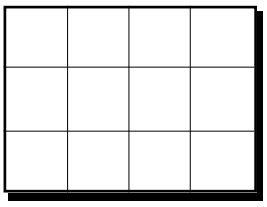
g 

h 

i 

j 

2. a Use a ruler to draw this rectangle measuring 4 boxes by 3 boxes. Shade in $\frac{1}{2}$ of it.



b Draw the same box again. This time shade or colour in $\frac{1}{4}$ of the shape.

c Draw the same box again. This time shade or colour in $\frac{1}{3}$ of the shape.

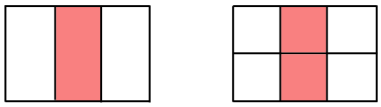
d Draw the same box again. This time shade or colour in $\frac{3}{4}$ of the shape.

e Draw the same box again. This time shade or colour in $\frac{5}{6}$ of the shape.

f Draw the same box again. This time shade or colour in $\frac{7}{12}$ of the shape.

3. Two fractions might have different **numerators** and **denominators** but they might still represent the same number :-

Look at the two diagrams representing fractions.



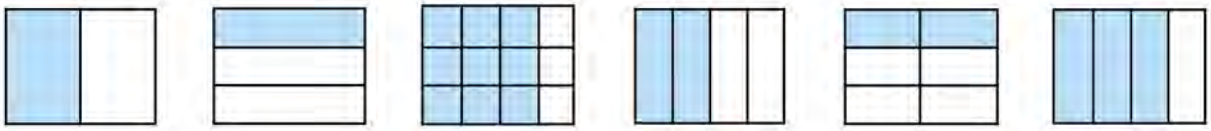
A B

a What fraction is shaded in figure A ?

Can you see that the fraction shaded in B is $\frac{2}{6}$?

b What do the two diagrams tell you about the fractions $\frac{2}{6}$ and $\frac{1}{3}$?

4. Make neat sketches of the following and write down underneath each one the fraction represented by the shading :-



$\frac{1}{2}$ $\frac{?}{?}$ $\frac{?}{12}$ $\frac{?}{4}$ $\frac{?}{?}$ $\frac{?}{?}$

a From the six pictures you can see another fraction equal to $\frac{1}{2}$. ($\frac{1}{2} = \frac{?}{?}$) ?

b The second and fifth diagrams show that $\frac{1}{3}$ is the same as $\frac{?}{?}$?

c The third and the last diagram shows that $\frac{?}{12}$ is the same as $\frac{?}{?}$?

5. It is possible to find a fraction **equivalent** to $\frac{2}{3}$ by simply "multiplying the numerator and the denominator by any number" :-

=> $\frac{2}{3}$ becomes $\frac{2 \times 4}{3 \times 4} = \frac{8}{12}$ numerator x 4 / denominator x 4

a Multiply the top and the bottom of $\frac{2}{3}$ by 5 to create a new fraction. What is it ?

b Multiply the top and the bottom of $\frac{2}{3}$ by 6 to create a new fraction. What is it ?

c Find at least 5 more fractions equivalent to $\frac{2}{3}$.

6. By choosing any (simple) number as a multiplier, find another fraction equivalent to :-

a $\frac{1}{2}$ **b** $\frac{3}{4}$ **c** $\frac{2}{5}$ **d** $\frac{5}{6}$ **e** $\frac{1}{3}$ **f** $\frac{3}{10}$.

7. It is possible to **simplify** fractions (like $\frac{6}{8}$) by "dividing" top and bottom by a number.

=> $\frac{6}{8}$ becomes $\frac{6 \div 2}{8 \div 2} = \frac{3}{4}$ (*This is the fraction in its **simplest form***).

a By dividing the top line and bottom line of each fraction by 2, simplify each one :-

(i) $\frac{10}{12}$ **(ii)** $\frac{8}{10}$ **(iii)** $\frac{20}{22}$ **(iv)** $\frac{14}{24}$ **(v)** $\frac{16}{30}$ **(vi)** $\frac{18}{26}$.

7. **b** By dividing the top line and bottom line of each fraction by 3, simplify each one :-

(i) $\frac{9}{12}$ **(ii)** $\frac{12}{15}$ **(iii)** $\frac{3}{18}$ **(iv)** $\frac{21}{24}$ **(v)** $\frac{30}{33}$ **(vi)** $\frac{15}{27}$.

c By dividing the top line and bottom line of each fraction by 5, simplify each one :-

(i) $\frac{5}{10}$ **(ii)** $\frac{20}{25}$ **(iii)** $\frac{45}{100}$ **(iv)** $\frac{15}{50}$ **(v)** $\frac{25}{55}$ **(vi)** $\frac{200}{205}$.

8. This is where it really pays to know your tables well !!

For each of the following fractions, find a number that will divide into both the numerator **and** the denominator to simplify the fraction :-

a $\frac{8}{12} \begin{matrix} \div 4 \\ \div 4 \end{matrix}$ **b** $\frac{5}{15}$ **c** $\frac{7}{14}$ **d** $\frac{16}{24}$ **e** $\frac{18}{24}$

f $\frac{28}{35} \begin{matrix} \div 7 \\ \div 7 \end{matrix}$ **g** $\frac{9}{12}$ **h** $\frac{8}{32}$ **i** $\frac{24}{36}$ **j** $\frac{30}{100}$

k $\frac{4}{12}$ **l** $\frac{24}{32}$ **m** $\frac{50}{75}$ **n** $\frac{10}{25}$ **o** $\frac{75}{100}$

p $\frac{4}{16}$ **q** $\frac{21}{56}$ **r** $\frac{18}{36}$ **s** $\frac{22}{33}$ **t** $\frac{40}{50}$.

Fractions of a Quantity

Exercise 2

a $\frac{1}{4}$ of 248 **b** $\frac{1}{5}$ of 365 **c** $\frac{1}{3}$ of 315

d $\frac{1}{8}$ of 2048 **e** $\frac{1}{7}$ of 2352 **f** $\frac{1}{11}$ of 3003

g $\frac{1}{15}$ of 4500 **h** $\frac{1}{12}$ of 1452 **i** $\frac{1}{30}$ of 960.

(Harder) To find $\frac{2}{3}$ of a number (like 18), you do it in **2 steps**.

Step 1 :- Find $\frac{1}{3}$ of 18 (÷ 3) first => $\frac{1}{3}$ of 18 = 18 ÷ 3 = **6**

Step 2 :- Now find $\frac{2}{3}$ of 18 by (x 2). => $\frac{2}{3}$ of 18 = **6** x 2 = **12**

Here's how you should set down the working :-

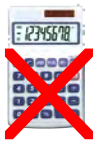
$\frac{2}{3}$ of 18 => (18 ÷ 3) => 6 x 2 = **12**

$\frac{3}{4}$ of 20 => (20 ÷ 4) => 5 x 3 = **15**

$\frac{5}{6}$ of 12 => (12 ÷ 6) => 2 x 5 = **10**

Rule :-
To multiply by a fraction like $\frac{3}{5}$
=> "divide by the denominator" (5)
=> then "multiply by the numerator" (3)

3. Do the following **without a calculator** :-



a $\frac{2}{3}$ of 30 => (30 ÷ 3) => 10 x 2 = ...

b $\frac{3}{4}$ of 24 => (24 ÷ ...) => ... x 3 = ...

c $\frac{2}{5}$ of 15 **d** $\frac{4}{5}$ of 30 **e** $\frac{5}{6}$ of 18

f $\frac{3}{8}$ of 32 **g** $\frac{3}{10}$ of 80 **h** $\frac{2}{9}$ of 18

i $\frac{3}{7}$ of 28 **j** $\frac{7}{8}$ of 40 **k** $\frac{7}{10}$ of 50

l $\frac{3}{100}$ of 200 **m** $\frac{9}{10}$ of 70 **n** $\frac{3}{4}$ of 240.

4. Do the following :- (*You may use a calculator*).

a $\frac{3}{5}$ of 160 => (160 ÷ 5) => 32 x 3 = ...

b $\frac{7}{8}$ of 240 => (240 ÷ ...) => ... x 7 = ...

c $\frac{2}{3}$ of 120 **d** $\frac{3}{4}$ of 560 **e** $\frac{7}{10}$ of 1700

f $\frac{3}{5}$ of 85 **g** $\frac{5}{9}$ of 270 **h** $\frac{3}{7}$ of 364

i $\frac{7}{8}$ of 640 **j** $\frac{5}{6}$ of 192 **k** $\frac{4}{5}$ of 720.

5. **a** A school has 850 pupils. $\frac{3}{5}$ of them are girls.

(i) How many girls are there ? **(ii)** How many boys ?

b I earn £256 per week. I spend $\frac{3}{8}$ of it on food.

(i) How much do I spend on food ? **(ii)** How much am I left with ?

c Of the 96 mental questions a girl did in class, she got $\frac{7}{8}$ of them correct.

(i) How many correct answers did she get ? **(ii)** How many were wrong ?

Back to Percentages

In **Chapter 4** on percentages, you discovered how to find **17% of £80** using a calculator.

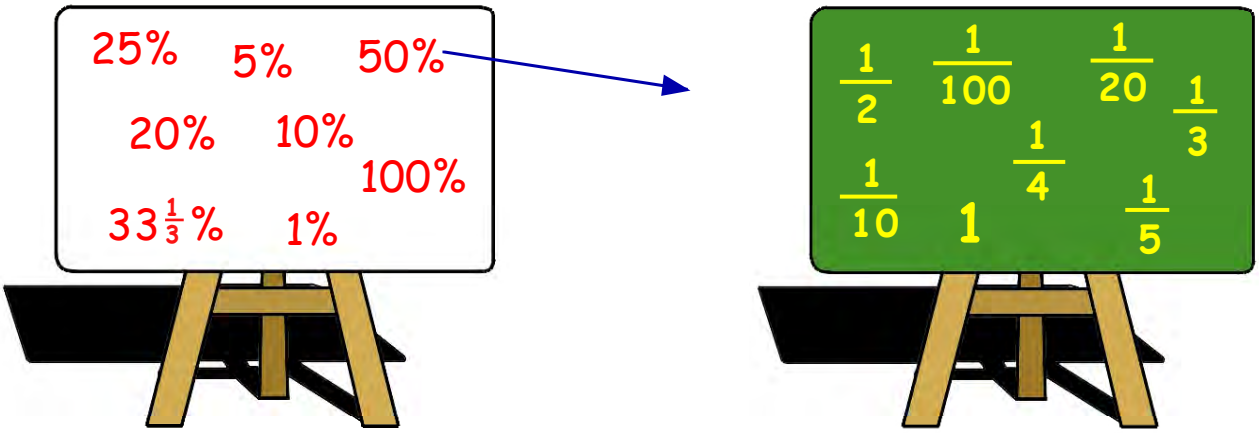
17% of £80 = $\frac{17}{100}$ x £80 = (17 ÷ 100) x £80 = 13·6 = **£13·60.** *note the 0*

There are some very basic percentages which can be thought of as simple fractions.

Example :- 50% = $\frac{50}{100} \overset{\div 10}{\div 10}$ = $\frac{5}{10} \overset{\div 5}{\div 5}$ = $\frac{1}{2}$ => 50% = $\frac{1}{2}$

Exercise 3

1. Discuss with your teacher which of these percentages match up with which fractions.



2. Copy and complete this table using your answers obtained from question 1.

percentage	100%	50%	$33\frac{1}{3}$%	25%	20%	10%	5%	1%
fraction	....	$\frac{1}{2}$	....	....	....	....	....	....

You **must** learn and know how to use these to answer basic percentage questions.

You can now do simple percentage work using the equivalent fraction instead :-

Example :- 50% of £40 means $\frac{1}{2}$ of £40 (= 40 ÷ 2) = **£20**

3. Do the following **mentally** :-

a 50% of £80 **b** 50% of 24 **c** 50% of 1800.

4. Find without a calculator :-

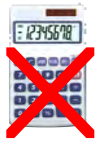
(Remember :- 25% means $\frac{1}{4}$).

a 25% of £20 (= $\frac{1}{4}$ of 20 = 20 ÷ 4 = £....)

b 25% of £400 **c** 25% of £16 **d** 25% of 240.

5. Find the following without a calculator :-

(Remember :- 20% means $\frac{1}{5}$).



a 20% of £15 **b** 20% of £60 **c** 20% of £2500.

6. Find the following without a calculator :- (*Use fractions instead*).

a 50% of £160 **b** 25% of £32 **c** 20% of £55

d 10% of £80 **e** 100% of £37 **f** $33\frac{1}{3}$% of £60

g 25% of £12 **h** 1% of £400 **i** 20% of £450

j 50% of £1200 **k** $33\frac{1}{3}$% of £120 **l** 5% of £40.

7. 50% of the pupils in a school of 840 are boys. How many boys are in the school ?

8. I earn £360 per week as a van driver.

I spend 25% of it on paying my mortgage.

a How much of the £360 is spent on my mortgage ?

b How much of the £360 does that leave me with ?

9.

Maisy saw a pair of curtains priced £45 last week at "Harry's Textiles".

This week there was $33\frac{1}{3}$% off the price in a sale.

a Calculate how much Maisy saved in the sale.

b How much did she actually pay for the curtains ?

A Few More Percentages

By now, you should have **memorised** the percentage <=> fraction equivalences.

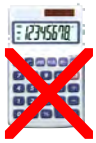
Can you also see that :-

$75\% = 3 \times 25\% = 3 \times \frac{1}{4} = \frac{3}{4}$

and

$40\% = 2 \times 20\% = 2 \times \frac{1}{5} = \frac{2}{5}$?

Exercise 4



1. Copy the following and complete :-

a $75\% = 3 \times 25\% = 3 \times \frac{1}{4} = \ldots$ **b** $40\% = 2 \times 20\% = 2 \times \frac{1}{5} = \ldots$

c $60\% = 3 \times 20\% = 3 \times \frac{1}{5} = \ldots$ **d** $80\% = 4 \times \ldots\% = 4 \times \frac{1}{5} = \ldots$

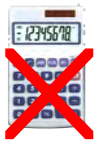
e $66\frac{2}{3}\% = \ldots \times 33\frac{1}{3}\% = \ldots \times \frac{1}{3} = \ldots$ **f** $30\% = 3 \times 10\% = \ldots \times \frac{1}{10} = \ldots$

g $70\% = \ldots \times 10\% = \ldots \times \ldots = \ldots$ **h** $90\% = \ldots \times \ldots\% = \ldots \times \ldots = \ldots$

2. You now have an **extended** list to learn :-

percentage	50%	25%	75%	$33\frac{1}{3}\%$	$66\frac{2}{3}\%$	20%	40%	60%	80%	10%	30%	70%	90%
fraction	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{4}{5}$	$\frac{1}{10}$	$\frac{3}{10}$	$\frac{7}{10}$	$\frac{9}{10}$

Copy this list into your jotter and **memorise** the above connections.
You will need them to do mental percentage work.



3. Copy and complete the following :- (no calculator)

a 40% of £30 = $\frac{2}{5}$ of £30 => (30 ÷ 5) => 6 x 2 = £....

b 80% of £40 = $\frac{4}{5}$ of £40 => (... ÷ 5) => ... x 4 = £....

c 75% of £16 = $\frac{3}{4}$ of £.... => (... ÷ ...) => ... x 3 = £....

d $66\frac{2}{3}\%$ of £21 = ... of £21 => (... ÷ ...) => ... x ? = £....

4. Do the following **MENTALLY** by using the fractions instead of the percentages :-

a	**(i)**	25% of £80	**(ii)**	75% of £80
b	**(i)**	20% of £15	**(ii)**	60% of £15
c	**(i)**	20% of £40	**(ii)**	80% of £40
d	**(i)**	$33\frac{1}{3}\%$ of £18	**(ii)**	$66\frac{2}{3}\%$ of £18
e	**(i)**	10% of £90	**(ii)**	70% of £90
f	**(i)**	10% of £120	**(ii)**	30% of £120
g	**(i)**	20% of £150	**(ii)**	40% of £150
h	**(i)**	10% of £300	**(ii)**	90% of £300
i	**(i)**	10% of £140	**(ii)**	5% of £140 (half of 10%)
j	**(i)**	1% of £600	**(ii)**	7% of £600.

5. Use the above "two step" approach to find the following :-

a 75% of £12 (think of 25% = $\frac{1}{4}$ of £12 first, then .....)

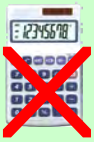
b	40% of £35	**c**	60% of £15	**d**	$66\frac{2}{3}\%$ of £36
e	30% of £70	**f**	70% of £50	**g**	60% of £45
h	6% of £200	**i**	75% of £80	**j**	80% of £150.

6. Lucy saw a coat priced £120 in a sale. The notice said "**75% OFF**."

a Calculate 75% of £120.

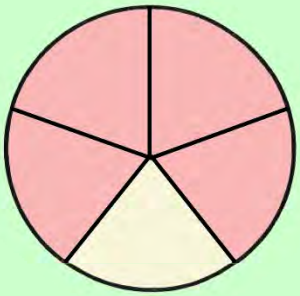
b How much did Lucy end up paying for the coat ?

What Have I Learned ?

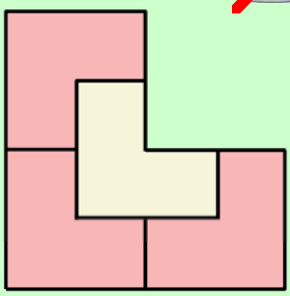


1. What fraction of each of these two shapes is pink ?

a



b



2. **a** Write down one other fraction equivalent to the fraction $\frac{5}{7}$.

b Write down any two fractions equivalent to $\frac{4}{11}$.

3. Simplify the following fractions :-

a $\frac{8}{10}$ **b** $\frac{24}{36}$ **c** $\frac{35}{40}$.

4. Find :- **a** $\frac{1}{2}$ of 22 **b** $\frac{1}{4}$ of 28.

5. Find :- **a** $\frac{3}{5}$ of 30 **b** $\frac{5}{6}$ of 18.

6. I collected 80 shells from the beach. $\frac{2}{5}$ of them were "razor shells".
How many razor shells had I collected ?

7. What **fraction** is equivalent to :-

a 25% **b** 20% **c** 70% ?

8. Do the following **mentally** :-

a 50% of 180 **b** 10% of £35

c 25% of 44 **d** $33\frac{1}{3}$% of £120

e 20% of £350 **f** 1% of £80

g 5% of £90 **h** 100% of £3·60

i 75% of 60p **j** $66\frac{2}{3}$% of £1·50.

CHAPTER 12

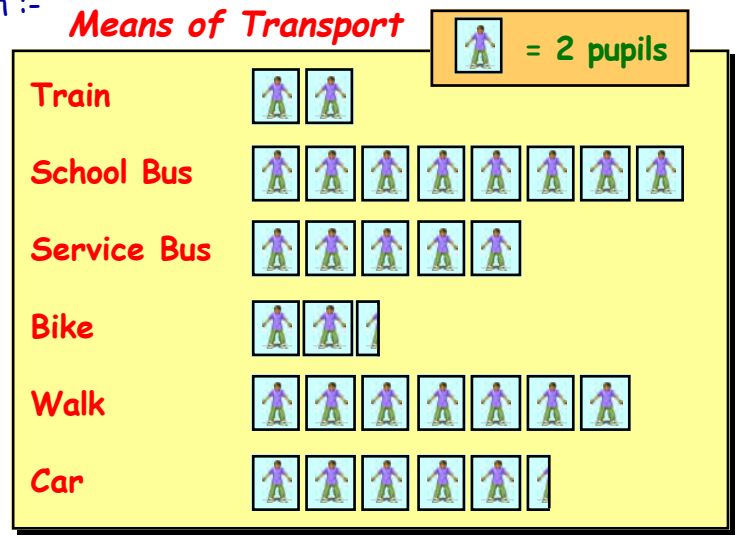
Statistics 1

Interpreting Graphs - Pictographs, Bar Graphs & Line Graphs

Exercise 1

1. A survey was taken in classes 1A and 1B on *"how I travel to school"*.

The results are shown in the Pictograph :-



a What is the most popular method of travelling to school ?

b What is the least popular ?

c How many were present when the survey took place ?

d How many **more** walk to school than go by bike ?

e What **fraction** of the class come by either bus or train ?

2. This pictograph shows the sales of computer games during a sale at "Electronic Palace".

a How many "**Medal of Honour**" games were sold ?

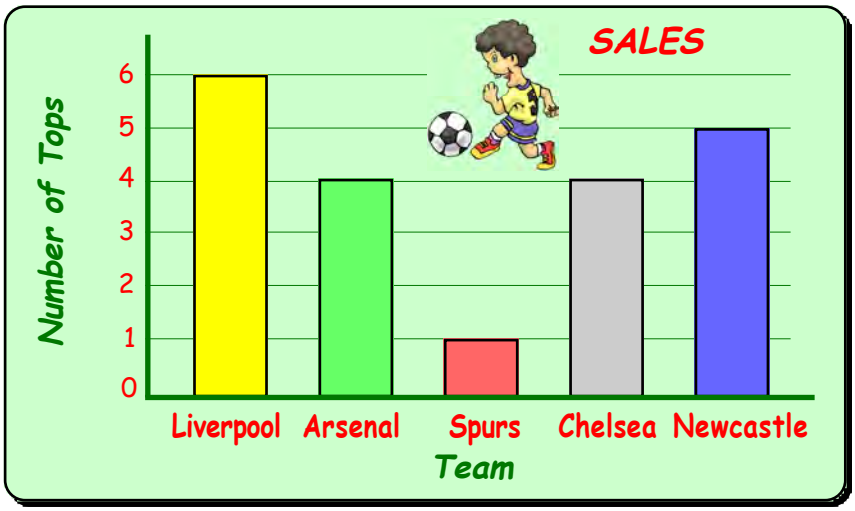
b What was the most popular game ?

c How many **more** "**FIFA Football**" games were sold than "**Spin City**" ?

d The "**Nick Faldo Golf**" game did not sell very well.
Compare sales of this game with "**Medal of Honour**".

e What **fraction** of the total number of games sold was "**FIFA Football**" ?

3. This bar chart shows the sales of football tops in a Glasgow Sports Shop one morning between 9·00 am and 12·00 noon.



a How many **Chelsea** tops were sold ?

b What was the most popular top sold that morning ?

c What was the least popular top sold that morning ?

d Which two tops sold in the same quantity ?

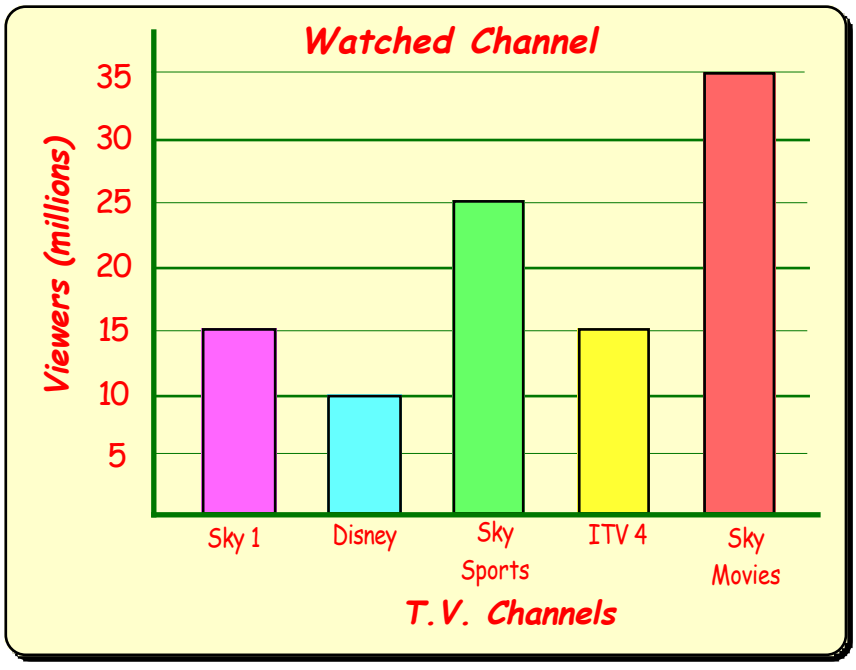
e How many more **Liverpool** tops were sold than **Newcastle** ?

f How many tops were sold altogether ?

g What **fraction** of the total number of tops sold were **Newcastle** tops ?

4. This bar chart shows the number of viewers who regularly watch various digital T.V. channels.

Disney Channel



a Which T.V. channel is most popular ?

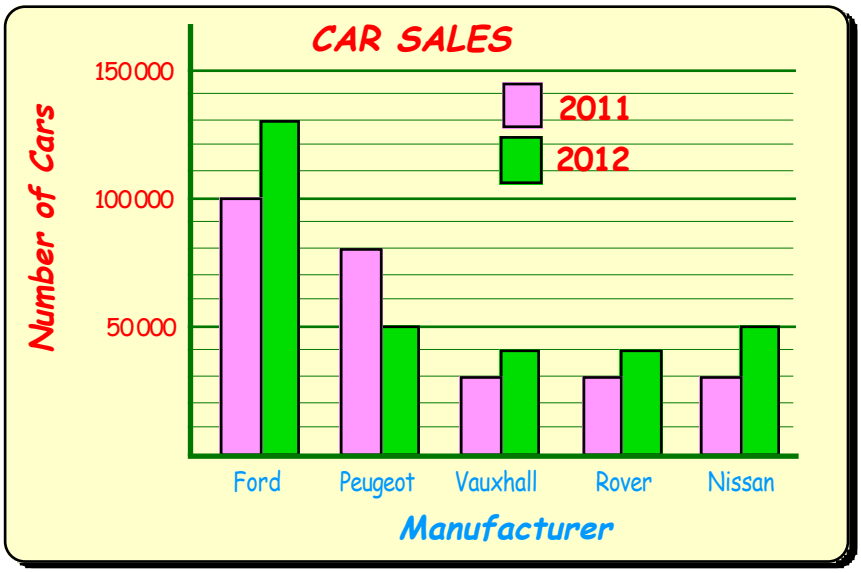
b Which channel was watched by the least number of viewers ?

c Which two channels have the same number of viewers ?

d How many people in total watch the channels ?

e Which T.V. channel was watched by $\frac{1}{4}$ of all the viewers ?

5. This bar chart shows the approximate number of cars sold by various manufacturers in the first three months of the years 2011 and 2012.



a How many **more** Ford cars were sold in 2012 than in 2011 ?

b How many **less** Nissan cars were sold in 2011 than in 2012 ?

c Only one company's sales fell from 2011 to 2012. Which one ?

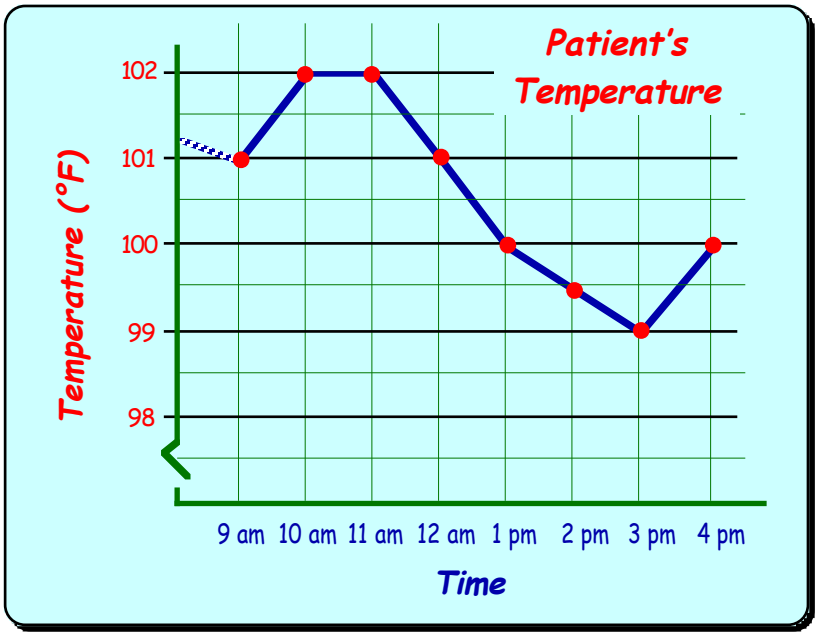
d What was the **total** number of cars sold in 2012 ?

e Which two companies had the identical sales records over the 2 years ?

f After Ford, which car manufacturer sold most cars altogether over the 2 years ?

6. A nurse took a patient's temperature every hour from 9 am until 4 pm.

The results are shown in this line graph.



a When was the patient's temperature at its **highest** ?

b When was it at its **lowest** ?

c By how many degrees did it fall between 11 am and 3 pm ?

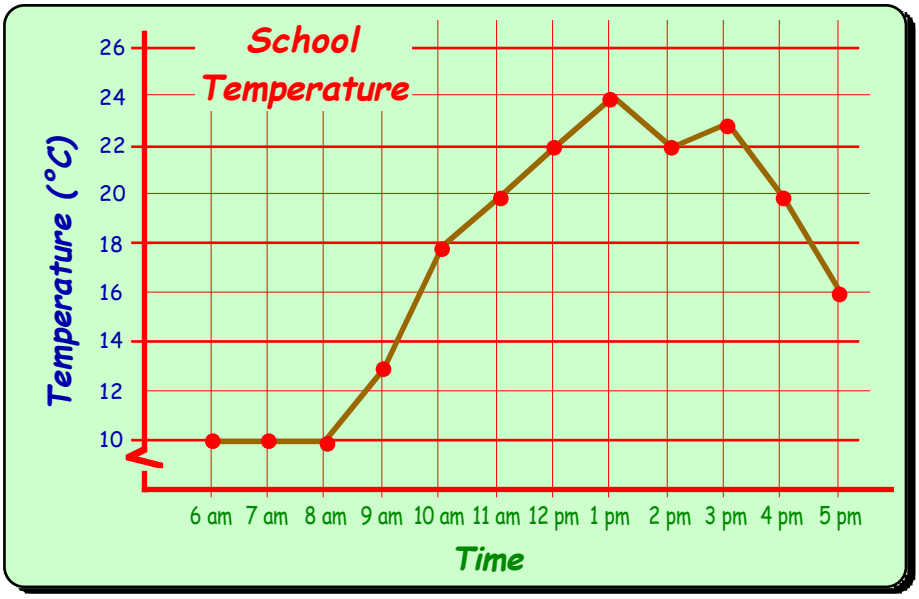
d At which two times did the temperature begin to rise ?

e Estimate the patient's temperature at 12·30 pm.

7. The janitor recorded the temperature at Moire High School.

He noted the temperature every hour from 6 am until the school closed at 5 pm.

The results are shown in this line graph.



a At what time do you think the school's heating system came on ?

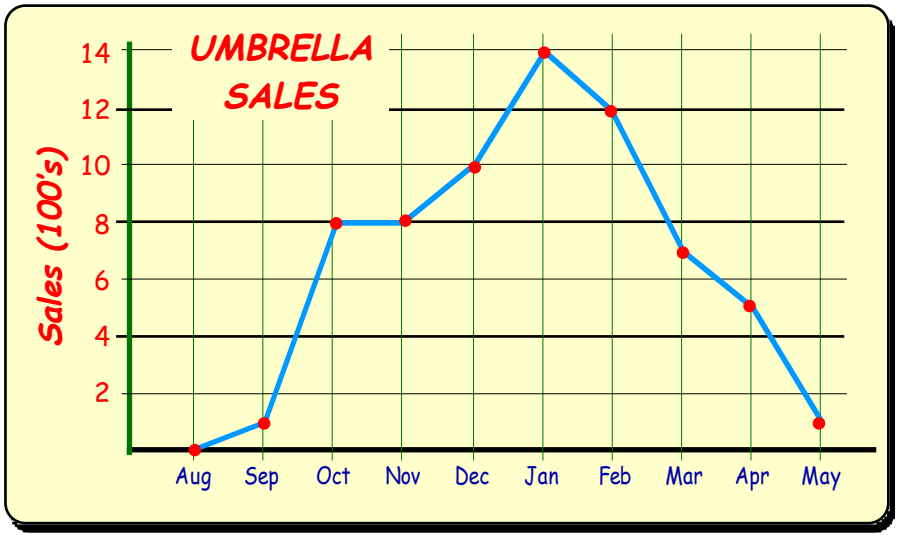
b What was the highest temperature and when did this occur ?

c Give a reason for the drop in temperature between 1 pm and 2 pm.

d By how many °C did the temperature rise between 8 am and 12 pm ?

e When do you think the heating system switched itself off for the day ?

8. This line graph shows the number of umbrellas sold (in 100's) by Grace Bros from August 2012 until May 2013.



a Why are sales so low in August ?

b During which two consecutive months do sales remain the same ?

c Between which two consecutive months did sales –

(i) rise the most **(ii)** fall by the most ?

d When are sales at their maximum ? Why ?

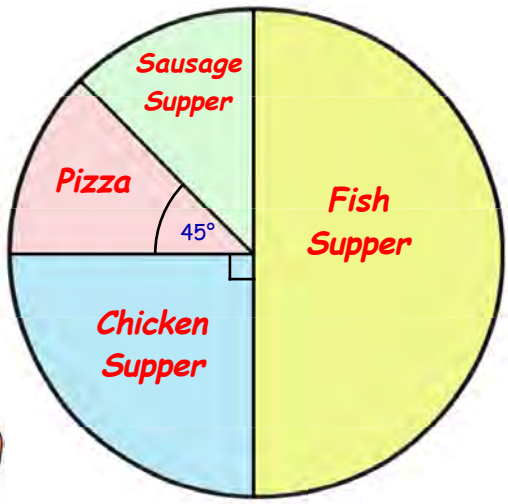
e Why do sales appear to fall after January ?

f Grace Bros sell some umbrellas in May – but not a lot ! How many ?

g What was the general "trend" of the graph after January ?

9. 40 people were asked whilst queuing in Dave's Fish Bar, – "What is your favourite meal which can be bought here in Dave's".

The result of the survey is shown in this pie chart.



a List the meals in order of popularity, starting with the favourite.

b What two kinds of meals were equally popular ?

c What **fraction** of the 40 people surveyed preferred :-

(i) a fish supper ?

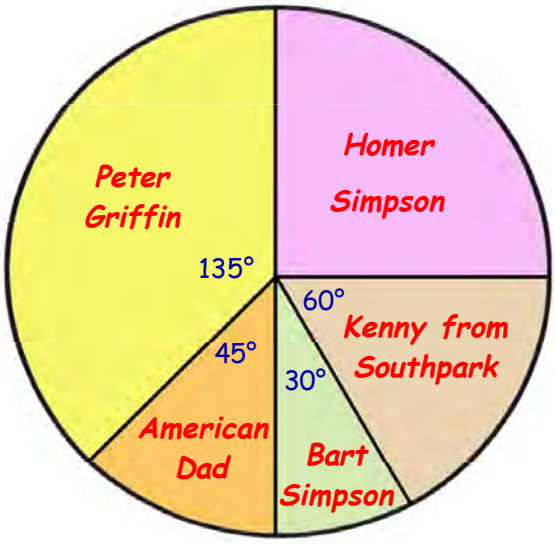
(ii) a chicken supper ?

(iii) a pizza ?

d **How many** of the 40 people asked preferred :-

(i) a fish supper **(ii)** a chicken supper **(iii)** a sausage supper ?

10.



Mrs Green asked her 24 Primary 4 pupils who their favourite cartoon characters were.

This pie chart shows the result.

a Which cartoon character was the most popular ?

b Which, of those mentioned, was the least popular ?

c What **fraction** of the pupils voted for :-

(i) Homer **(ii)** Kenny (= $\frac{60}{360}$ *simplified*)

(iii) Bart **(iv)** American Dad ?

d Calculate how many of the 24 pupils liked :-

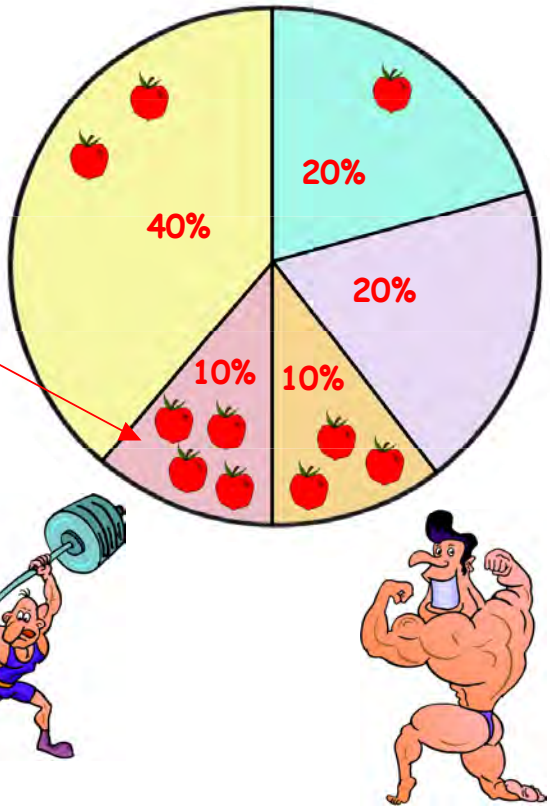
(i) Homer ($\frac{1}{4}$ of 24) **(ii)** Kenny

(iii) Bart **(iv)** American Dad ?

e How many liked Peter Griffin ?

11. A health club draws up a pie chart showing the number of apples eaten one week by its 200 members.

The result of the survey is shown in this pie chart.



a How many of the 200 members eat :-

(i) 4 apples in a week ? (*10% of 200*)

(ii) 1 apple in a week ?

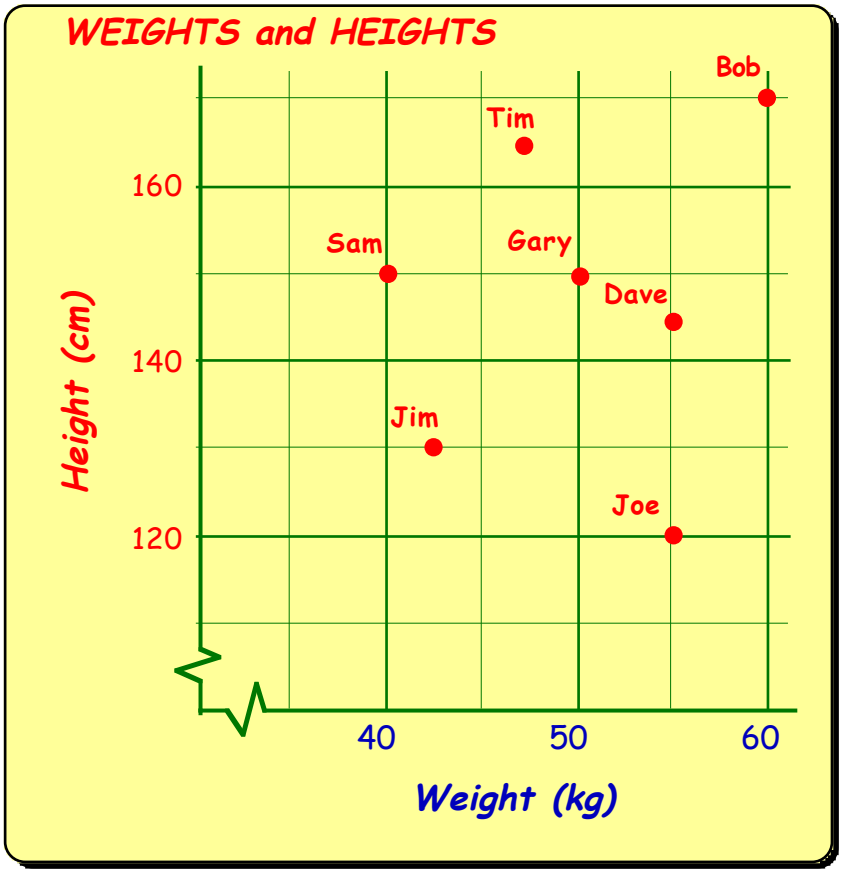
b Use your answer to part **a** to find how many apples are eaten **altogether** by those members who eat "**4 apples**" per week.

c Calculate the total number of apples eaten in one week by all 200 members.

Scattergraphs & Codes

Exercise 2

1. This scattergraph shows the height and weight of seven young boys at a rugby match.



a What weight is Bob ?

b What height is Joe ?

c Which two boys are the same height ?

d Which two boys are the same weight?

e Who is the lightest ?

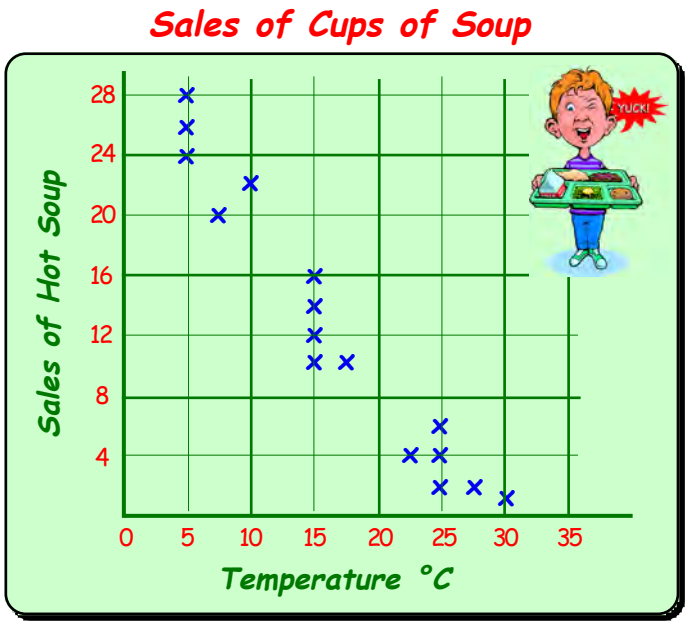
f Who is the smallest ?

g What weight is Jim ?

h How much heavier is Bob than Dave ?

i How much taller is Gary than Dave ?

2. This scattergraph shows a connection between the temperature during the day and the sales of cups of hot soup from Dave's Cafe.



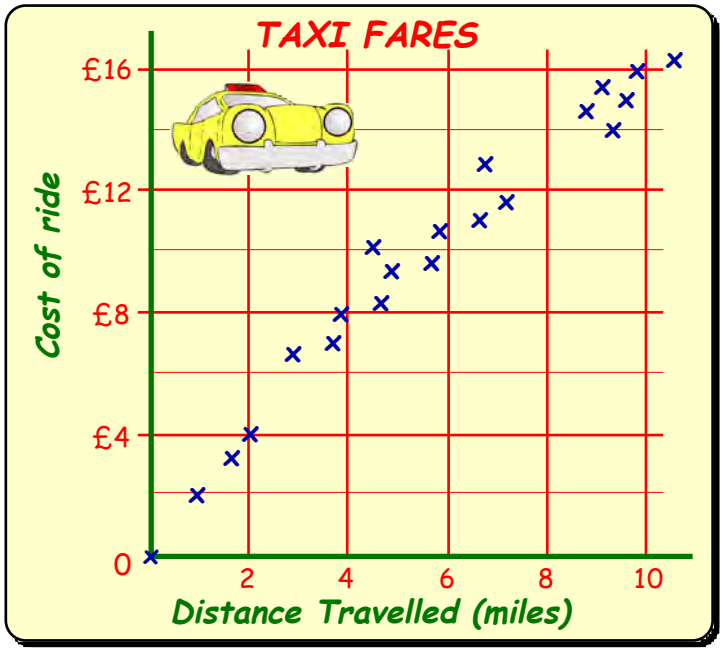
a Suggest in words a connection between the temperature and the sales of cups of hot soup.

b Use the graph to estimate how many cups of soup will be sold when the temperature is 20°C.

c When the temperature was 10°C, how many cups of soup were sold ?

d Estimate what the temperature might have been when 18 cups of hot soup were sold.

3. This scattergraph shows the fares which taxi drivers charge for short distances around town.



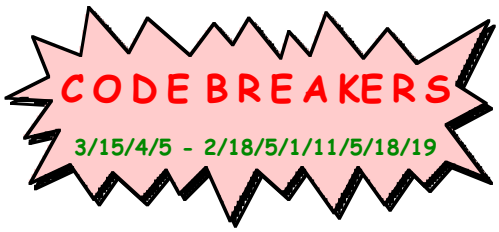
a What is the link between the number of miles travelled and the taxi fare ?

b Why is there a cross at (0,0) ?

c Use the diagram to find how far you could travel for £6·00.

d Estimate how much an 8 mile journey would cost ?

4.



A	B	C	D	E	F	G	...
1	2	3	4	5	...	...	...

a Copy and complete the table above showing all 26 letters of the alphabet.

11 / 25 / 12 / 9 / 5 - is the code for **K Y L I E** ? (check it !!)

b In the same way decode these names :-

(i) **20 / 15 / 14 / 25** **2 / 12 / 1 / 9 / 18**

(ii) **20 / 9 / 7 / 5 / 18** **23 / 15 / 15 / 4 / 19**

(iii) **13 / 1 / 4 / 15 / 14 / 14 / 1.**

5. The ***KIMBALL** tags on goods in a shop are shown opposite.

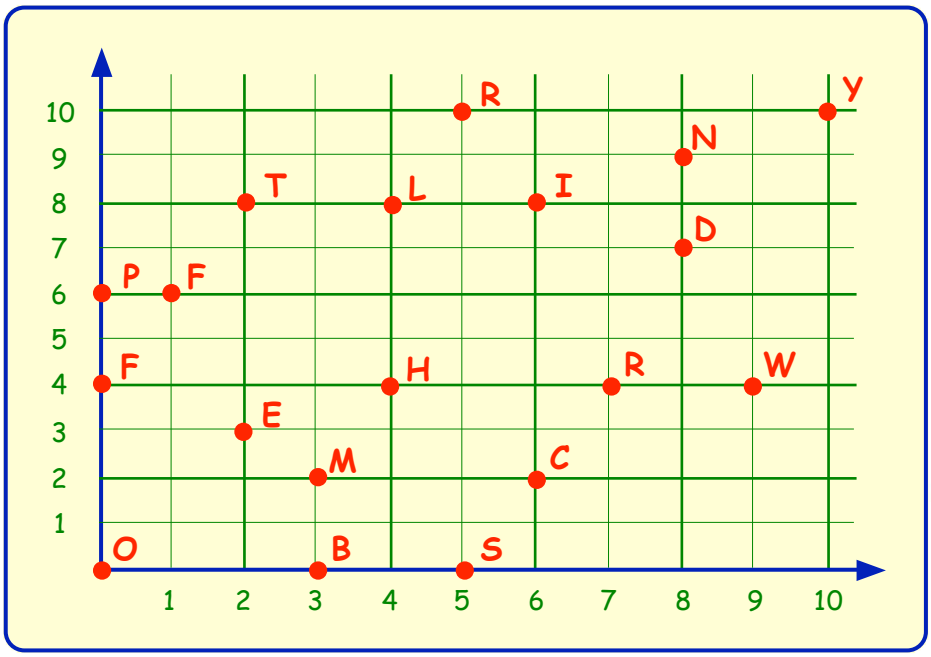
(**This is a code used by shops to price items*).

- The Trunks are priced **£16·35**.
- The Bikini is really **£42·90**.

Use the above two pieces of information to work out and write down the code for a bath robe costing **£69·52**.

6. Corporal Jones is sending a message to HQ using a code to stop others from reading his messages.

Jones uses this coordinate diagram to give HQ the position of each letter.



The message **(4,4) (6,8) / (2,8) (4,4) (2,3) (7,4) (2,3)**

says **" H I T H E R E "**

Decode these two messages :-

a (9,4) (4,4) (2,3) (8,9) / (9,4) (6,8) (4,8) (4,8) / (9,4) (2,3) / (3,2) (2,3) (2,3) (2,8).

b (3,0) (10,10) (2,3) / (0,4) (0,0) (7,4) / (8,9) (0,0) (9,4).

7. **a** Make up a grid and message of your own.

b Swap grids with your friends and decode each other's messages.

Stem & Leaf Diagrams

Exercise 3

1. A group of people were asked their ages before entering a rock concert.

The data is shown in this stem-and-leaf diagram.

Age in years	
1	7 7 8 9
2	4 5 6 6 7 8
3	1 7

Key :- 1 | 9 = 19 years

a The first level should read as :-

- 17 years, 17 years, 18 years, 19 years.

Write out the ages in **level 2** in the same way.

b **(i)** What age was the youngest person surveyed ?

(ii) How many were that age ?

c What age was the **oldest** person ?

d How many people were in the survey ?

e Copy and complete :-

"Most of the people asked were in their ....**'s**".

(*teens, 20's or 30's,.... ?*)

2.

Money taken in	
1	4 7
2	0 2 2 4 7 8 9
3	1 1 1 4 9
4	3
5	5 6 7 8

Key :- 2 | 4 = £2·40

Sales in a newspaper shop were recorded over a 1 hour period.

a List the amount of money taken in, in order of size, starting with the least amount i.e. £1·40.

b Which level has the most data ?

c Which amount of money appears most often (the mode) ?

d How many takings are there below £2·70 ?

e How many customers bought items from the shop in the hour ?

3. The marks for pupils in a Primary 6 spelling test are shown in this stem-and-leaf diagram.

Pupils' Marks

0	9
1	2 5 5 7
2	0 1 3 6 8
3	0 4 4 8
4	7 7 7 8 8 9
5	0

Key :- 1 | 2 = 12

a The test was marked out of 50.

How many pupils scored :-

(i) full marks

(ii) half-marks

(iii) a mark of 34 ?

b How many pupils sat the test ?

c Work out the **median** mark. (the "middle" mark).

d What was the most common mark (the **mode**) ?

4. The ages of new members joining the Hawkhead Bowling Club are shown below.

New Members' Ages

3	0
4	
5	9 8
6	4 1 5 2 2 3 7 2
7	6 4 7 1

Key :- 6 | 3 = 63 years old

a The stem-and-leaf diagram has **not** been set out in order.

Rearrange the ages so that a new stem-and-leaf diagram is constructed with the ages in order.

b What age was the :-

(i) youngest

(ii) oldest new member ?

c Why is there an empty space at "**4**" ?

5. Ten senior citizens aged in their **60's** and ten senior citizens aged in their **70's**, were asked how many times per year they went to the hairdresser's.

Number of Hair-do's

sixties		seventies
3	0	1
3 2 2 1	1	3 5
0	2	2 2 4
7 1	3	0
9 4	4	8
	5	1 2

Key :- 2 | **1** means 12 times, and **4** | 8 means 48 times.

a One person gets her hair done once per year. In which age group is she (60's or 70's) ?

b For the 10 senior citizens in their 60's, add **all** the visits together.
How many times did they visit the hairdresser altogether ?

c Do the same for the 10 senior citizens in their 70's.

d Who went more often – the 10 in their sixties or the 10 in their seventies ?

Drawing Graphs & Charts

Exercise 4

1. Using the **standard** symbols shown to represent a boy and a girl, illustrate these birth-months in a **pictograph**.

Boy - ♂ Girl - ♀

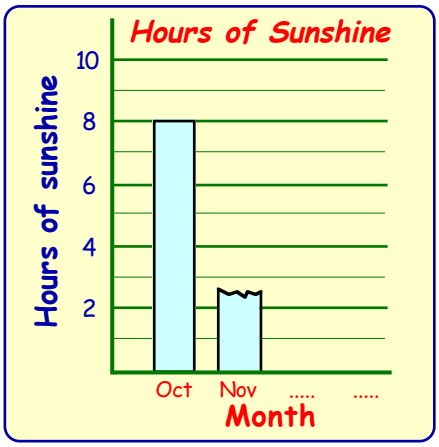
January	8 boys born	4 girls born
February	3 boys born	7 girls born
March	1 boy born	3 girls born
April	5 boys born	5 girls born
May	10 boys born	0 girls born
June	0 boys born	3 girls born

January	♂♂♂♂♂♂♂♂ ♀♀♀♀
February	

2. This table shows the average daily hours of sunshine in Malaga from October to April.

Oct	Nov	Dec	Jan	Feb	Mar	Apr
8	6	5	3	$6\frac{1}{2}$	7	10

Draw a **BAR CHART** to show the information.

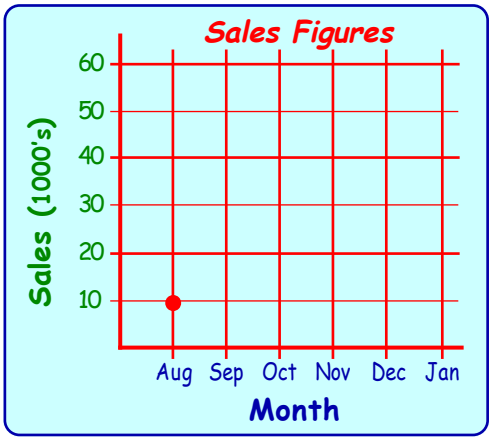


3. The sales figures for a new game are shown in this table.

Month	Aug	Sep	Oct	Nov	Dec	Jan
Sales (1000's)	10	25	20	30	55	5

a Show the above data in a **LINE GRAPH** using a scale like the one shown opposite.

b Why were the sales so high in December ?

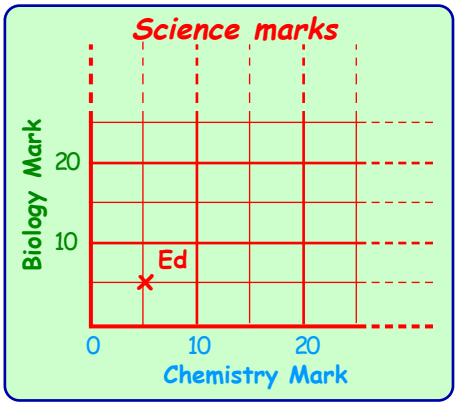


4. Shown is a table of exam marks from a Science department.

Pupil	Ed	Kim	Joe	Ann	Lyn	Bob	Tom
Chemistry	5	20	40	40	50	40	10
Biology	5	25	10	35	40	50	10

a Draw a scatter diagram, similar to the one shown, plotting the information from the table.

b One person's marks appear "different" from the pattern of the rest of the class. Who is the "odd one out" ?



5. The weights of 20 newborn kittens (to the nearest gram) are given below.

52	47	65	41	50	55	73	48	60	57
65	49	54	63	89	50	64	71	59	57

Draw an **ORDERED STEM-AND-LEAF** diagram to illustrate this data.

(*Remember to state a* ***key***).

Calculation of Averages - Range, Mode, Median & Mean

As well as drawing graphs to represent information gathered, it is also possible to do calculations on numerical data which helps give more information.

Here are **2 types** of calculations you can do on a set of numbers.

You can work out how **widely spread** the set of numbers are - this is called the **RANGE**.

- **RANGE** = highest - lowest.

You can work out two **averages** :-

- The **MODE** is the number that appears **most**.
- The **MEDIAN** is the **middle** number when all the numbers are written **in order**.

Example :- Find the **RANGE**, **MODE** and **MEDIAN** for :- 3, 4, 5, 7, 8, 8, 9, 9, 9, 9, 11.

Range = 11 - 3 = **8**. **Mode** = **9** (most occurring). **Median** = **8** (Middle number).

Exercise 5

1. The **Range** (= HIGHEST – LOWEST).

For each set of data, find the **RANGE** of numbers :-

a 4, 6, 5, 9, 3, 12, 5, 4, 7, 7, 9, 2, 6, 8.

b 94, 78, 65, 32, 54, 29, 47, 22, 25, 21, 95, 37, 36, 28.

c 3·4, 6·1, 7·2, 1·9, 3·3, 4·7, 5·1, 8·4, 2·1, 6·3.

2. The **Mode** (the number that appears MOST often).

For each set of data, find the **MODE** :-

a 2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 5, 5, 5, 6, 6, 7, 8, 9.

b 8, 2, 5, 2, 1, 8, 6, 3, 2, 9, 3, 5, 2.

c 246, 240, 247, 241, 241, 249, 240, 241, 241, 242, 243, 243, 240, 244, 244, 240, 245, 246, 241, 246, 248, 249.

3. The **Median** (this is the MIDDLE score).
(*Make sure you put the numbers in order first*).

For each set of data, find the **MEDIAN** :-

a 2, 3, 3, 4, 5, 6, 6, 7, 8.

b 20, 22, 22, 25, 27, 29, 30, 31, 31, 33, 37.

c 8, 9, 9, 10, 12, 13, 14, 16.

d 9, 5, 2, 5, 5, 3, 4, 7, 6, 8, 8, 5, 5, 4, 1, 1, 9, 8, 7, 7, 4.

e £15, £18, £17, £16, £20, £21, £19, £17, £16, £16.

f 35g, 15g, 15g, 27g, 25g, 23g, 19g, 27g, 26g, 15g, 24g, 27g, 28g, 35g.

A Third Average - The Mean

Remember :- The **Mean** (or average)

$$\text{Mean} = \frac{\text{total of all the scores}}{\text{number of scores}}$$

Show how you added the set of numbers first, then show your division.

Example :- Find the **mean** of :-
4, 3, 2 and 7.

$$\text{Mean} = \frac{4 + 3 + 2 + 7}{4} = \frac{16}{4} = \mathbf{4}$$

4. Find the **Mean** of :-

a 3, 5, 7, 9.

b 8, 20, 11, 17, 24.

c £6, £9, £12, £30, £24, £3.

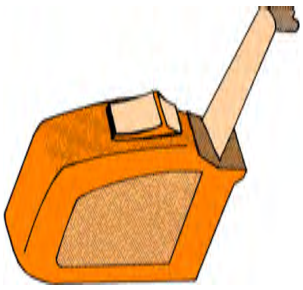
d 9 cm, 18 cm, 36 cm, 24 cm, 14 cm, 31 cm.

e 6·2, 4·1, 3·7, 5·4, 6·8, 3·9, 7·1, 1·6, 4·4.

f 3·85, 2·76, 1·93, 5·86.

5. Given below are the heights, to the nearest centimetre, of seven children.

175 cm, 176 cm, 186 cm, 172 cm, 190 cm, 182 cm, 185 cm.



Calculate :-

a the **range** of heights.

b the **mean** height, to the nearest cm.

c the **median** height (remember to put them in order first).

6. Mr James buys 10 jars of marshmallows.

He finds that they contain the following number of marshmallows.

50, 52, 54, 52, 55, 51, 53, 50, 54, 54.

a **(i)** Calculate the **mean** number of marshmallows.

(ii) Should he complain ?

b Find the **median**.

c What is the **mode** ?

7. Cricketers use the **mean** when calculating their average number of runs.

a Trevor scored a **total** of 515 runs in his 5 innings (5 games).

Find his average number of runs per innings.

b He scored 109 runs in his next innings.

What was his new average for the 6 innings ?

8. This **stem-and-leaf diagram** shows the number of people buying a lottery ticket from "Maitlands Store" in Kilmarnock over a period of 15 days.

a What is the **median** of the distribution ?

b What is the **range** ?

c Calculate the **mean** number of people buying a ticket over the 15 days.

Key :- 3 | 7 means 37 tickets were sold one day.

9.

The **mean** weight of 2 boys is 40 kilograms.

If Des weighs 45 kilograms, what must Andy weigh ?

10. The **mean** age of 3 boys, Tom, Dick and Angus, is 12.

- Tom is age 15.
- Dick is aged 9.

How old must Angus be ?

(*Think carefully how to do this !!*)

11. Bobby sat 4 maths tests marked out of 20. His average (**mean**) score was 14.

You can see what he scored in each of his first 3 tests.

Test 1 - 19 | Test 2 - 18 | Test 3 - 10 | Test 4 -

What must he have scored in his 4th test ?

12. The average length of 3 pet worms is 6·5 cm.

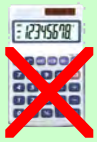
Calculate Sidney's length.

Willie 8 cm

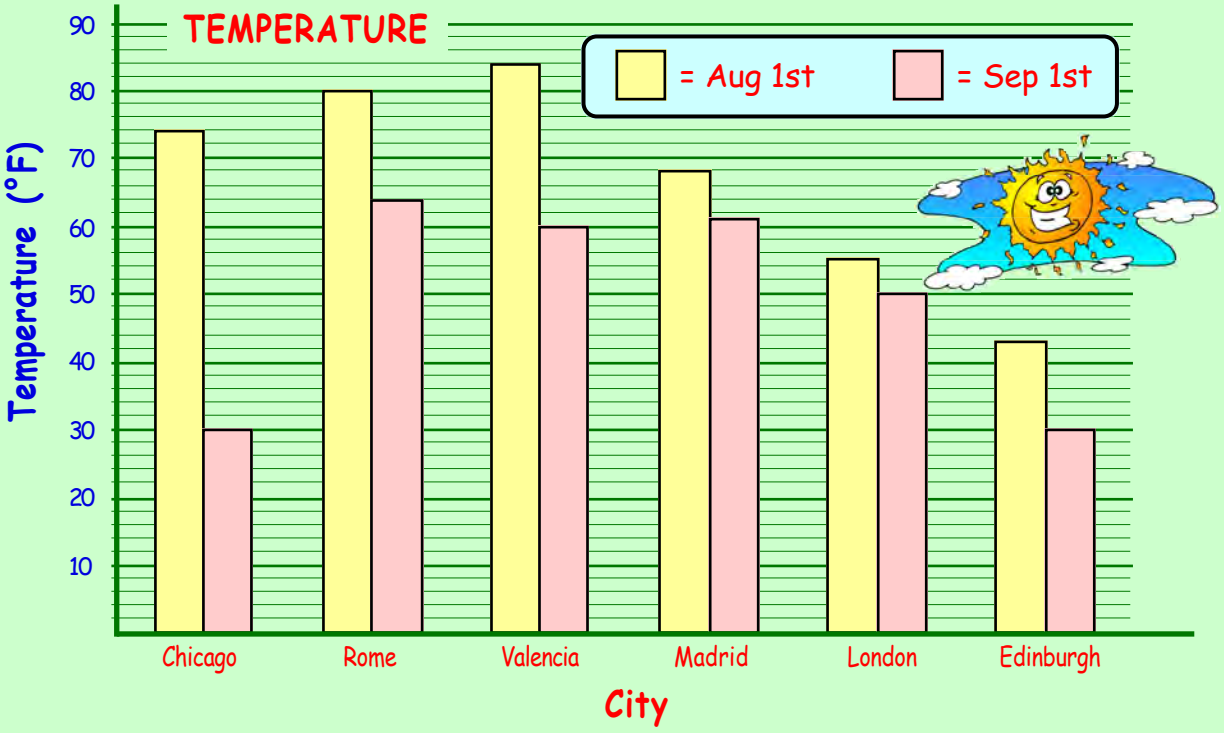
Sammy 4·5 cm

Sidney ? cm

What Have I Learned ?



1. The bar graph below shows the temperature in six places on 2 different days.



a What was the warmest place on August 1st ?

b What was the coldest place on August 1st ?

c What was the temperature in Rome on August 1st ?

d What was the temperature in Chicago on August 1st ?

e What was the temperature in Madrid on September 1st ?

f In which city did the temperature drop by the greatest amount from August 1st to September 1st ?

g Two cities were at the same temperature on September 1st.
Which two, and what was the temperature ?

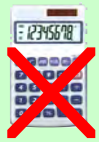
h How many places had a temperature greater than 75°F on August 1st ?

i Which place had a drop in temperature of 13°F between August and September ?

j Find the average (**mean**) temperature for these cities on :-

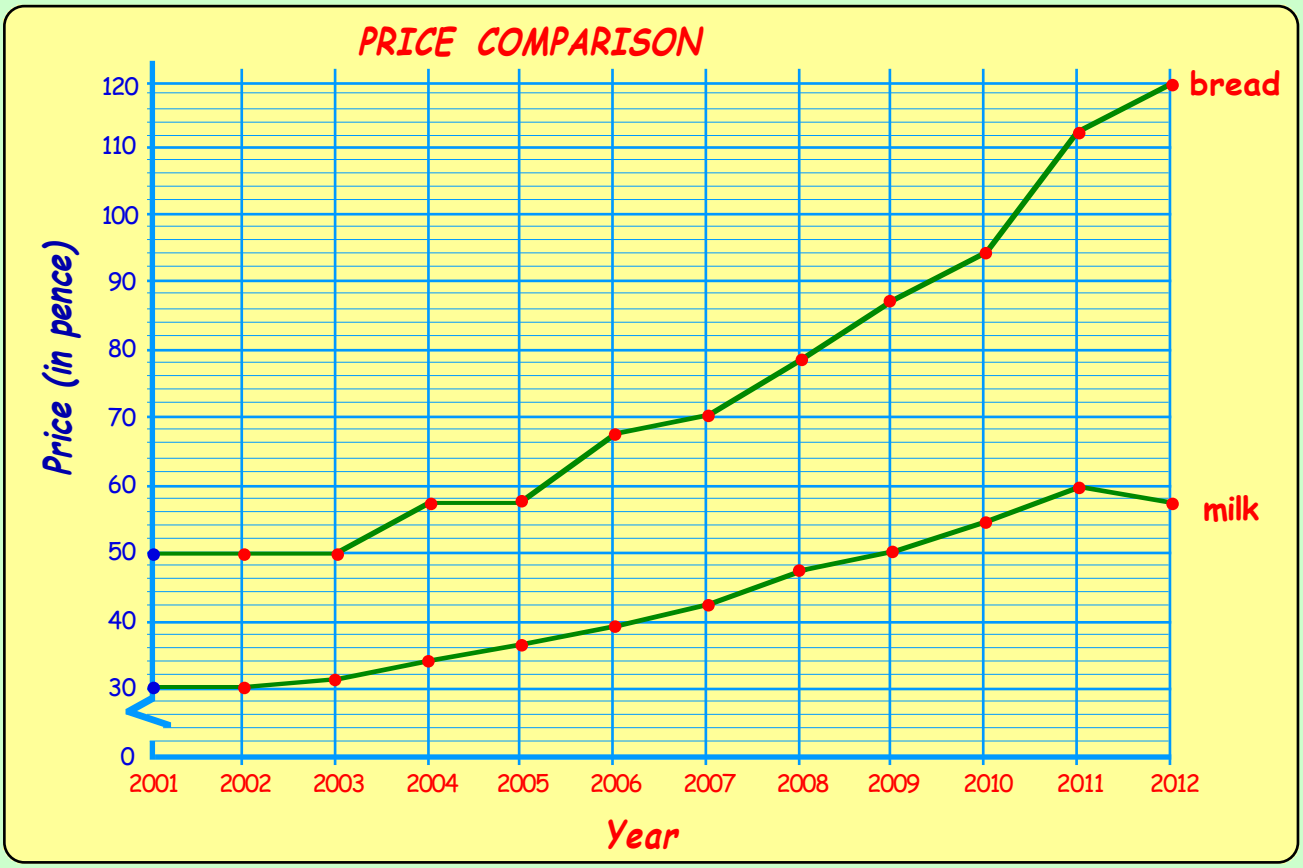
(i) August 1st **(ii)** September 1st.

What Have I Learned ?



2. The line graphs below show how the prices of 2 items have changed between 2001 and 2012.

The items are :- a loaf of bread and a pint of milk.



a What was the price of bread in :- **(i)** 2001 ? **(ii)** 2012 ?

b Between which years did the price of bread **not** increase ?

c Describe the trend of bread prices over the 12 years.

d What was the price of a pint of milk in :- **(i)** 2001 ? **(ii)** 2012 ?

e Describe the trend of bread prices compared to milk prices.

f Which item increased more in price and by how much ? Explain.

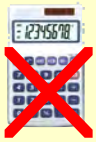
g One of the items dropped in price at one point.

Which one and when ?

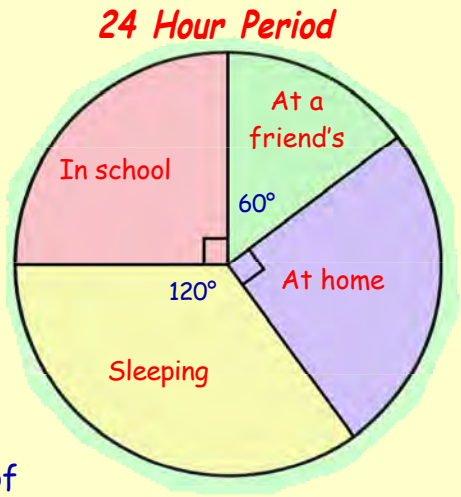
h How much more expensive was a loaf of bread than a pint of milk in :-

(i) 2004 ? **(ii)** 2010 ?

What Have I Learned ?



3. The pie chart shows how Kelly spent her time over a 24 hour period.



a **(i)** For what **fraction** of the day was Kelly **in school** ?

(ii) For what **fraction** of the day was Kelly in bed **sleeping** ?

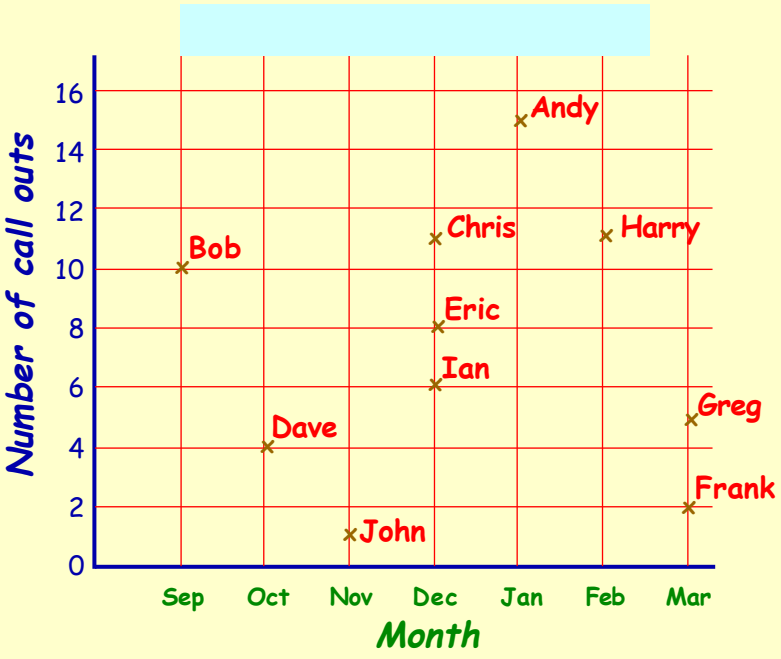
b For how many hours was Kelly :-

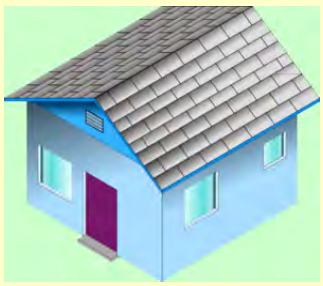
(i) In school **(ii)** At home

(iii) At a friend's house ($\frac{60}{360}$ x 24) **(iv)** Sleeping ?

4. An emergency roofer decided to monitor the number of call-outs his workers had to attend to over a period of time.

The results are shown in the scattergraph.





a How many emergency call outs did **Bob** make in September ?

b **Two** employees made the same number of call outs.

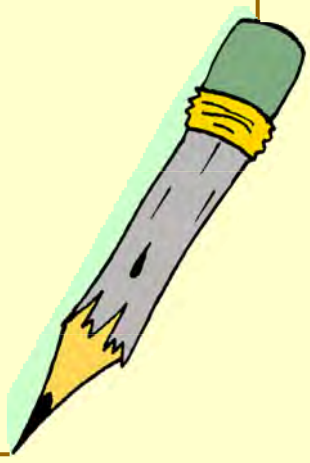
Who were they and in which months ?

c Which employee made the most call outs and in which month ?

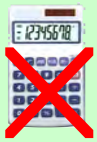
d Was December a very "**wild and windy**" month ? Explain.

e John said that November was a great month for weather.

How can you tell that this was the case ?

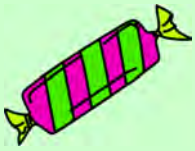


What Have I Learned ?



5. The amounts of money (pence) spent by children in a sweet shop are shown below.

41	61	21	52	42	60	53	38	58	45	59
62	84	51	24	72	49	43	72	66	31	71
50	35	80	60	35	59	24	86	30	55	46



a Copy the diagram opposite and set up an **ORDERED** stem-and-leaf diagram.
(*You may have to draw the stem-and-leaf diagram* ***unordered*** *then re-draw it as an ordered diagram*).

b How many children were in the survey ?

c What was the **median** (the middle amount) ?

Pocket Money

2	.....
3	.....
4	.....
5	.....
6	.....
7	.....
8	.....

Key :- 4 | 1 = 41 pence

6. A darts player threw 10 darts at a dartboard.
His scores were :-

20	18	5	18	5	5	12	1	20	5

a Write his scores in order, starting with the lowest.

b What was his **median** score ?

c What was the **mode** ?

7. The table shows some results from the English Premiership.

Premiership

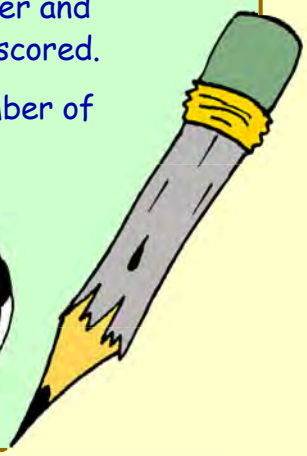
Arsenal	3	Spurs	3
Liverpool	1	Everton	2
Stoke	1	Fulham	2
Man City	3	West Brom	2
Newcastle	2	Man Utd	6

a What was the **range** of goals scored ?

b What was the **mode** ?

c Write the number of goals in order and find the **median** number of goals scored.

d Calculate the **mean** (average) number of goals scored.



CHAPTER 13

Pythagoras 1

Squares

To **Square** a number means to **multiply it by itself**.

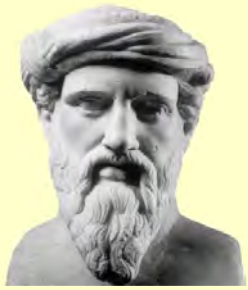
Example :-

"the square" of 7 is $7 \times 7 = 49$ (not 7×2)

We shorten this to "7 squared = $7 \times 7 = 49$"

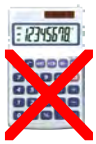
or even shorter => $7^2 = 7 \times 7 = 49$.

(We read 7^2 as "7 squared").



Exercise 1

1. **No calculator** in this question. Copy each line and find the value :-



a $6^2 = 6 \times 6 = ?$

b $4^2 = 4 \times 4 = ?$

c $2^2 = 2 \times ? = ?$

d $5^2 = 5 \times ? = ?$

e 9^2

f 10^2

g 1^2

h 3^2

i 0^2

j 8^2.

2. You **can** use a calculator this time. Find the values of :-

a 16^2 b 22^2 c 19^2 d 41^2

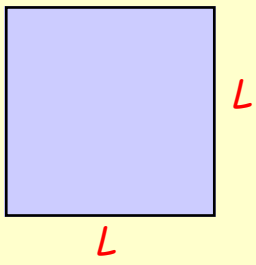
e 32^2 f 50^2 g 17^2 h 53^2

i 85^2 j 93^2 k 101^2 l 200^2.

It is possible to calculate the **area** of a **square** using the formula :-

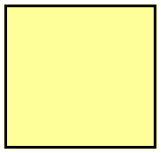
Area = (length)^2

or simply $A = L^2$



3. Calculate the areas of the following squares :-

a



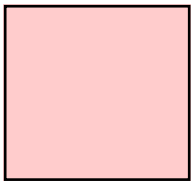
=>

Area = L^2

$A = 8^2$

$A = \ldots$ cm^2

b



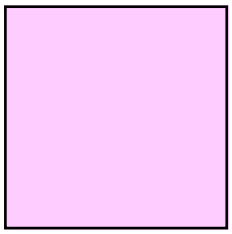
=>

Area = L^2

$A = 12^2$

$A = \ldots$ cm^2

3. **c**

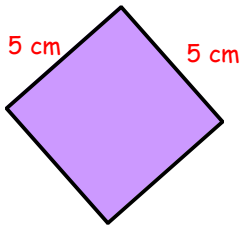


Area = L^2

=> A = ...^{2}

A = ... cm^2

d



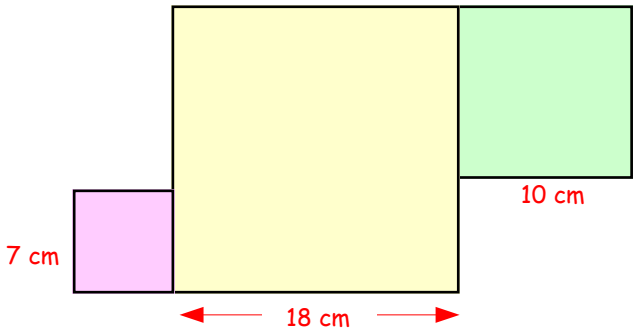
Area = L^2

=> A = ...^{2}

A = ... cm^2

4. Calculate the **total area** of this shape, which consists of three squares :-

(*Show all your working*).



5. Use your calculator to find :-

a $3^2 + 4^2$ **b** $7^2 + 6^2$ **c** $10^2 + 5^2$ **d** $8^2 + 2^2$

e $11^2 + 9^2$ **f** $2^2 + 3^2 + 4^2$ **g** $10^2 + 9^2 + 8^2$ **h** $13^2 + 15^2$.

6. **a** Use your calculator to find each of the following :-

$1^2 - 0^2$, $2^2 - 1^2$, $3^2 - 2^2$, $4^2 - 3^2$, $5^2 - 4^2$, $6^2 - 5^2$, $7^2 - 6^2$.

b Did you notice a pattern ? If so, write down the value of $8^2 - 7^2$ without using your calculator. Now check your guess with a calculator.

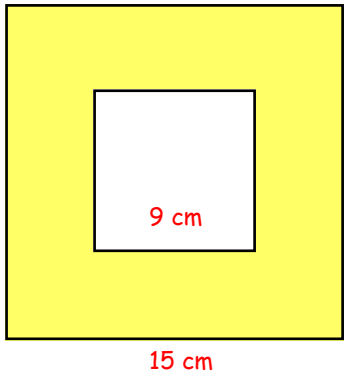
c No calculator. Write down the value of :- $9^2 - 8^2$, $10^2 - 9^2$, $11^2 - 10^2$.

7. Shown is a small square hole cut from a large square piece of cardboard.

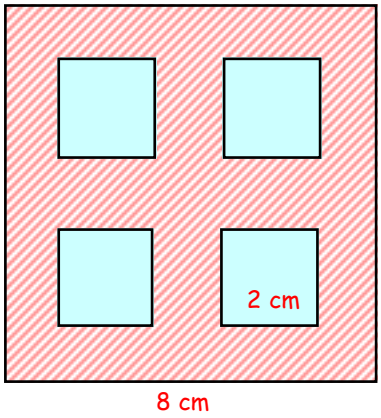
a Calculate the area of the large square.

b Calculate the area of the small square hole.

c Now calculate the yellow area. (*add or subtract ?*)



8.



By calculating the area of the large square and the area of the 4 small square holes, calculate the area of the red shaded part of this figure.

Square Roots

$\sqrt{}$

You now know how to find $7^2 = 7 \times 7 = 49$.

In reverse we sometimes want to know "**which number - times itself - gives 49**" ?

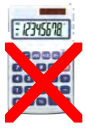
The answer, as can be seen from above, is obviously 7.

We say "**the SQUARE ROOT of 49 is 7**",

which shortens to $\sqrt{49} = 7$ (this reads as "the square root of 49 is 7")

Exercise 2

1. No calculator in this question. Copy each line and complete :-



a since $5^2 = 25 \Rightarrow \sqrt{25} = 5$ **b** since $4^2 = 16 \Rightarrow \sqrt{16} = ...$

c since $3^2 = 9 \Rightarrow \sqrt{9} = ...$ **d** since $8^2 = 64 \Rightarrow \sqrt{64} = ...$

e since $11^2 = 121 \Rightarrow \sqrt{121} = ...$ **f** since $2^2 = ? \Rightarrow \sqrt{4} = ...$

2. Find the following :-

a $\sqrt{36}$ **b** $\sqrt{1}$ **c** $\sqrt{81}$ **d** $\sqrt{100}$.

3. In this question, you should use the "$\sqrt{}$" button on your calculator to find :-

a $\sqrt{64}$ **b** $\sqrt{81}$ **c** $\sqrt{121}$ **d** $\sqrt{400}$ **e** $\sqrt{625}$

f $\sqrt{900}$ **g** $\sqrt{256}$ **h** $\sqrt{169}$ **i** $\sqrt{1{\cdot}44}$ **j** $\sqrt{3{\cdot}24}$.

Some "**square roots**" are not exact :-

$\sqrt{54} = 7{\cdot}3484692..... = 7{\cdot}35$ (to 2 decimal places) - check this !

4. Use your calculator to find the following to **two decimal places** :-

a $\sqrt{14}$ **b** $\sqrt{19}$ **c** $\sqrt{37}$ **d** $\sqrt{68}$ **e** $\sqrt{93}$

f $\sqrt{115}$ **g** $\sqrt{207}$ **h** $\sqrt{300}$ **i** $\sqrt{520}$ **j** $\sqrt{735}$.

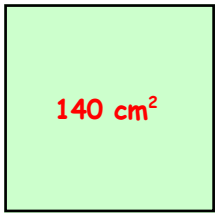
5.

This square shown has an **area** of 80 cm^2.

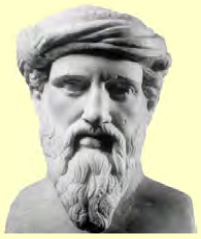
Calculate the length of one of its sides. ($\sqrt{80}$).

6. This square shown has an **area** of 140 cm^2.

Calculate the length of one of its sides.



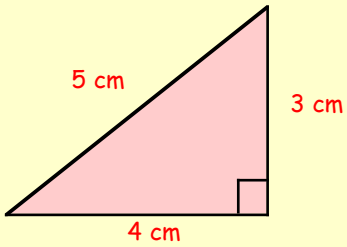
Pythagoras' Theorem



Pythagoras was a famous Greek Mathematician who discovered an amazing connection between the three sides of a **right angled triangle**. This connection means it is possible to **calculate** the length of one side of a right angle triangle as long as you know the length of the other two.

Look at this right angled triangle with sides 3 cm, 4 cm and 5 cm.

If you add the two smaller sides (3 cm and 4 cm) together do you get the longer side (5 cm) ? - **No** !



You see that $3^2 = 9$, $4^2 = 16$ and $5^2 = 25$?

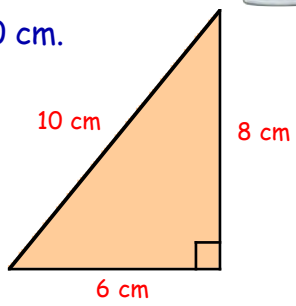
Can you also see that:-

$$3^2 + 4^2$$
$$= 9 + 16$$
$$= 25 = 5^2 \text{ ?}$$

Pythagoras found that this connection between the three sides of a right angled triangle was true for **every right angled triangle**.

Exercise 3

1. The three sides of this right angled triangle are 6 cm, 8 cm and 10 cm.

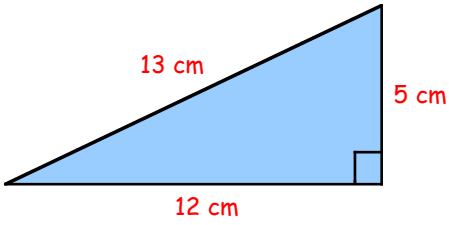


a Write down the values of 6^2, 8^2 and 10^2.

b Find the value of $6^2 + 8^2$.

c Check that $6^2 + 8^2 = 10^2$.

2. The three sides of this right angled triangle are 5 cm, 12 cm and 13 cm.

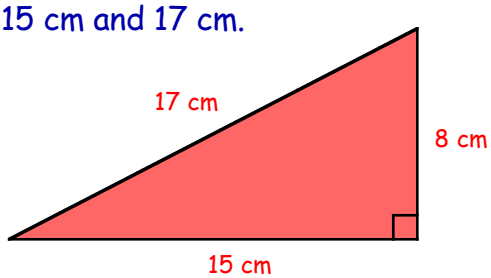


a Write down the values of 5^2, 12^2 and 13^2.

b Find the value of $5^2 + 12^2$.

c Check that $5^2 + 12^2 = 13^2$.

3. The three sides of this right angled triangle are 8 cm, 15 cm and 17 cm.

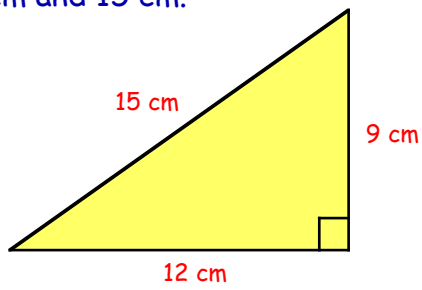


a Write down the values of 8^2, 15^2 and 17^2.

b Find the value of $8^2 + 15^2$.

c Check that $8^2 + 15^2 = 17^2$.

4. The three sides of this right angled triangle are 9 cm, 12 cm and 15 cm.

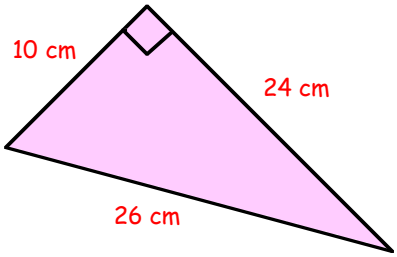


a Write down the values of 9^2, 12^2 and 15^2.

b Find the value of $9^2 + 12^2$.

c Check that $9^2 + 12^2 = 15^2$.

5.



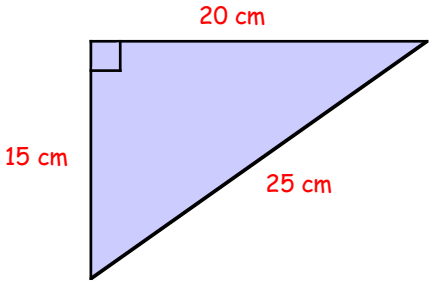
The three sides of this right angled triangle are 10 cm, 24 cm and 26 cm.

a Write down the values of 10^2, 24^2 and 26^2.

b Find the value of $10^2 + 24^2$.

c Check that $10^2 + 24^2 = 26^2$.

6. The three sides of this right angled triangle are 15 cm, 20 cm and 25 cm.



a Write down the values of 15^2, 20^2 and 25^2.

b Find the value of $15^2 + 20^2$.

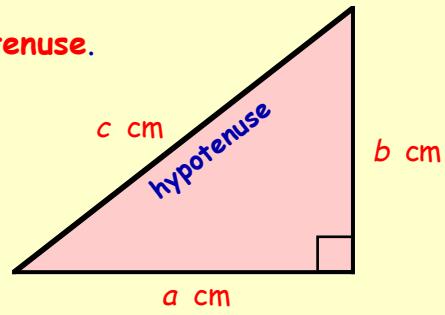
c Check that $15^2 + 20^2 = 25^2$.

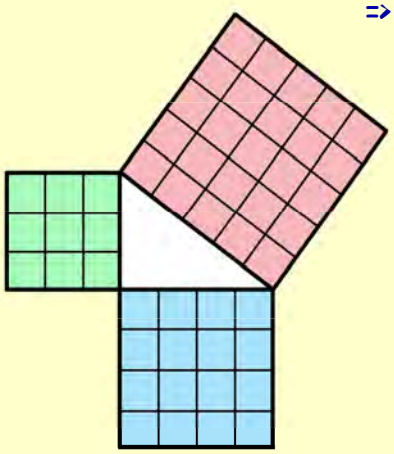
Pythagoras Theorem (proper)

Pythagoras made up a small rule which shows the connection between the three sides of any right angled triangle.

The **longest** side of a right angled triangle is called the **hypotenuse**.

If the three sides are *a* cm, *b* cm and *c* cm (the hypotenuse), then Pythagoras' rule states :-



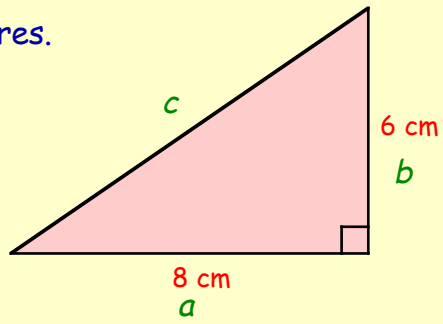


$\Rightarrow$ $c^2 = a^2 + b^2$

We can use this rule to calculate the length of the **hypotenuse** of a right angled triangle if we know the lengths of the **two smaller** sides.

Example 1 :- The two smaller sides of this right angled triangle are 8 centimetres and 6 centimetres.

To calculate the length of the hypotenuse, use **Pythagoras' Rule**.



$\Rightarrow \quad c^2 = a^2 + b^2$

$\Rightarrow \quad c^2 = 8^2 + 6^2$

$\Rightarrow \quad c^2 = 64 + 36 = 100$

$\Rightarrow \quad c = \sqrt{100} = \mathbf{10\ cm}$

This is how you set down the working.

Exercise 4

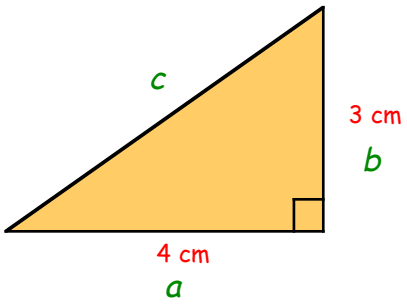
1. In the same way as shown above, use **Pythagoras' Rule** to calculate the length of the hypotenuse in this triangle :-

$\Rightarrow \quad c^2 = a^2 + b^2$

$\Rightarrow \quad c^2 = 4^2 + \ldots^2$

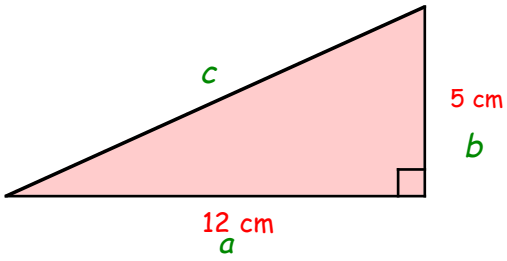
$\Rightarrow \quad c^2 = 16 + \ldots = \ldots$

$\Rightarrow \quad c = \sqrt{\ldots} = \ldots\ \mathbf{cm}$



***Copy** and complete the working.*

2.

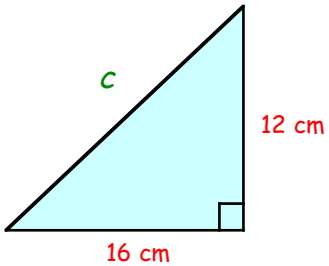


Use **Pythagoras' Rule** to calculate the length of the hypotenuse in the right angled triangle shown on the left.

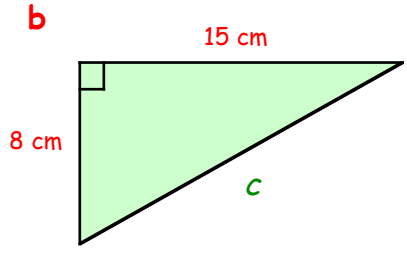
(*Set down your 4 lines of working as shown*).

3. Use Pythagoras' Rule to calculate the length of the hypotenuse in each of these triangles :-

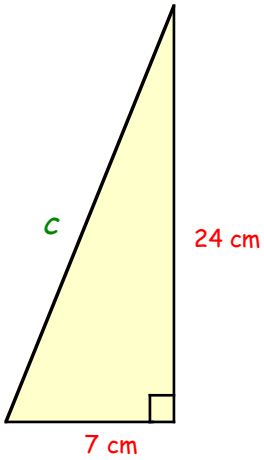
a



b



c



Example 2 :- You do not always get whole number answers.

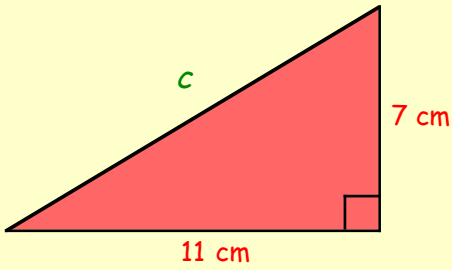
$\Rightarrow \quad c^2 = a^2 + b^2$

$\Rightarrow \quad c^2 = 11^2 + 7^2$

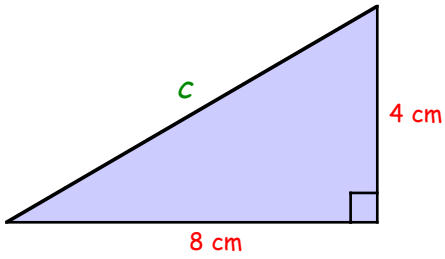
$\Rightarrow \quad c^2 = 121 + 49 = 170$

$\Rightarrow \quad c = \sqrt{170} = 13{\cdot}038404\ldots \text{ cm}$

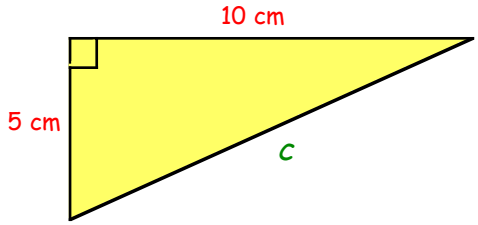
$= 13{\cdot}04 \text{ cm}$
(to 2 decimal places)



4. In the same way as shown above, use **Pythagoras' Rule** to calculate the length of the hypotenuse in this triangle, to 2 decimal places.

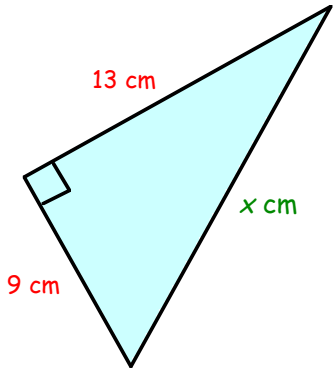


5.

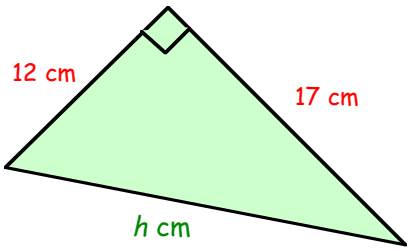


Use **Pythagoras' Rule** to calculate the length of the hypotenuse in the right angled triangle shown, to 2 decimal places.

6. Calculate the length of the hypotenuse marked x cm, to 2 decimal places.

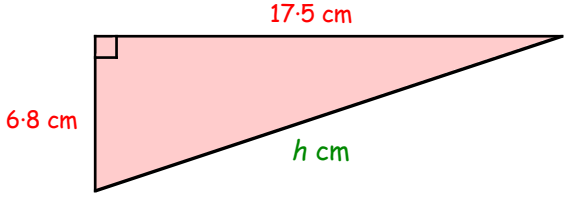


7.



Calculate the length of the line marked h cm, to 2 decimal places.

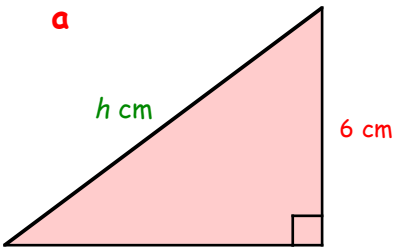
8. Calculate the length of the hypotenuse in this right angled triangle, to 2 decimal places.



9. Make a neat **sketch** of each of these right angled triangles :-

Use Pythagoras' Rule (called **Pythagoras' Theorem**) to calculate the length of the hypotenuse each time, correct to two decimal places.

a



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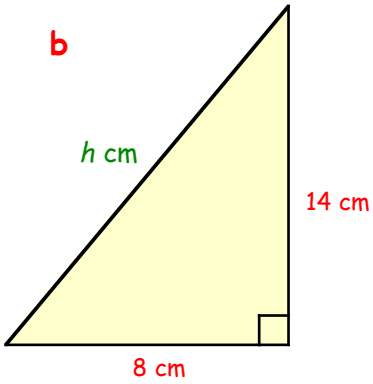

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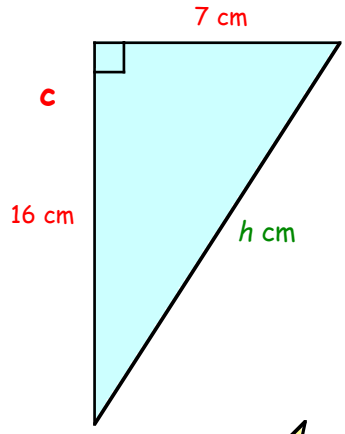

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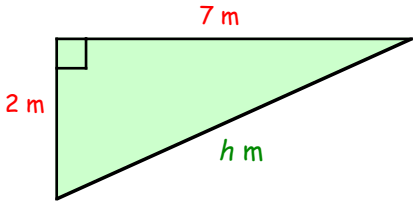

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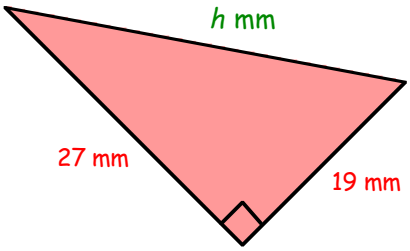

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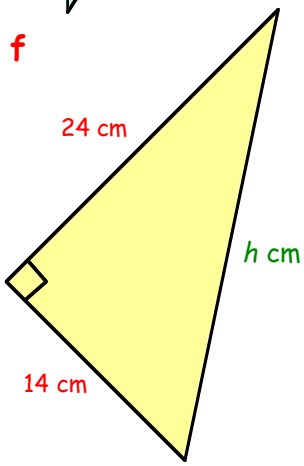
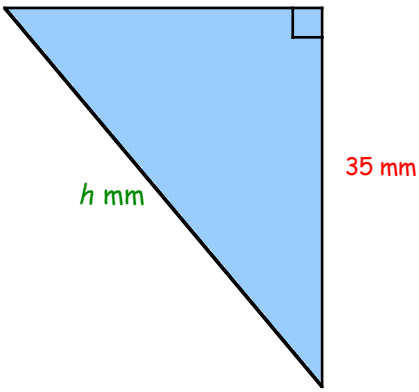
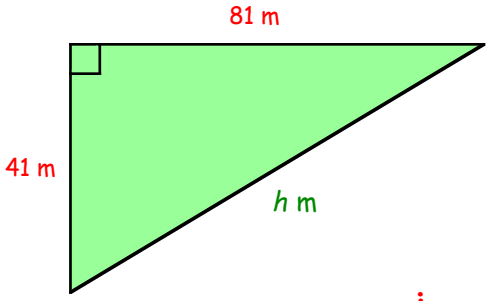


g



h



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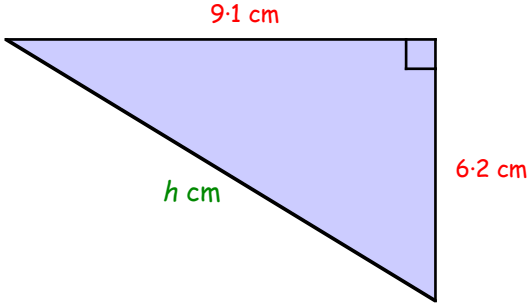
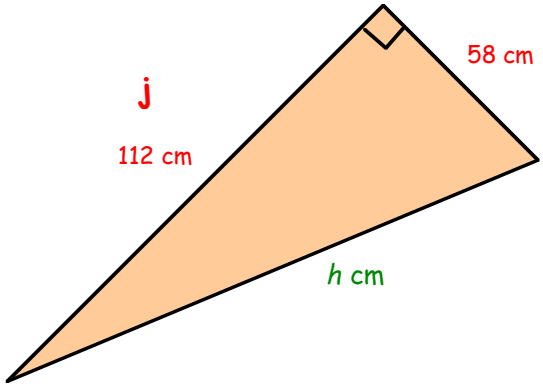


j



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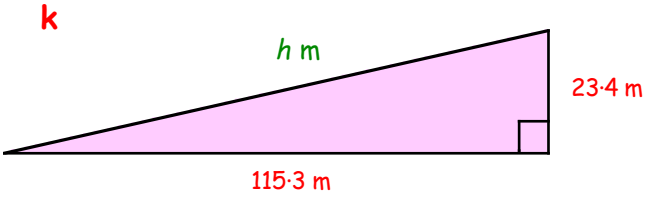
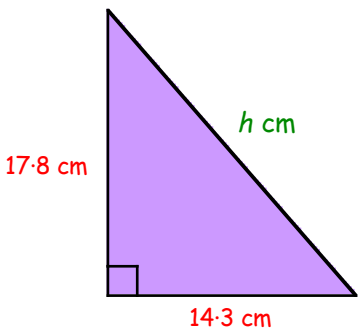
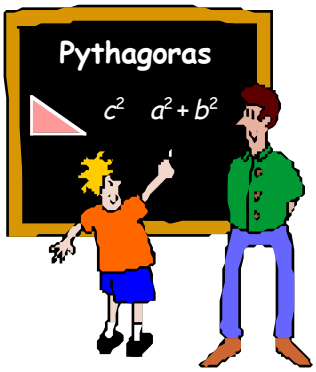


l



Problems involving Pythagoras' Theorem



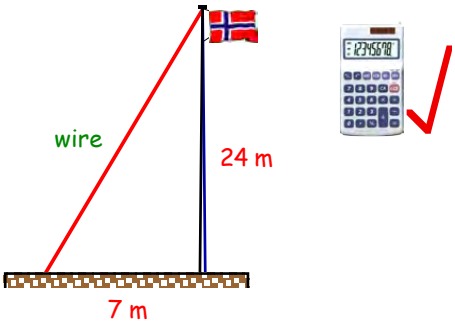
Whenever you come across a problem involving finding a missing side in a right angled triangle you should consider using Pythagoras' Rule to calculate its length.

Exercise 5

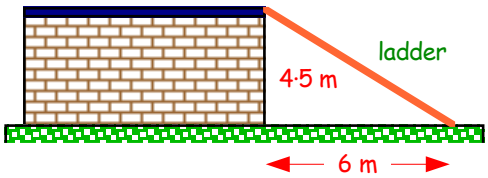
(The triangles in questions 1 to 7 are right-angled).

1. A wire is used to support a flagpole.

Calculate the length of the wire.



2.

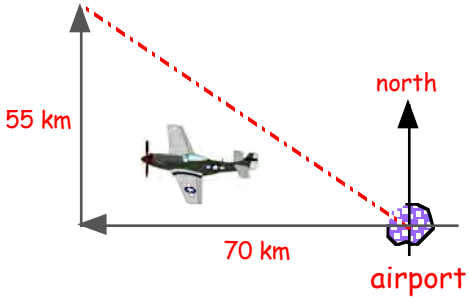


A ladder rests against a wall as shown.

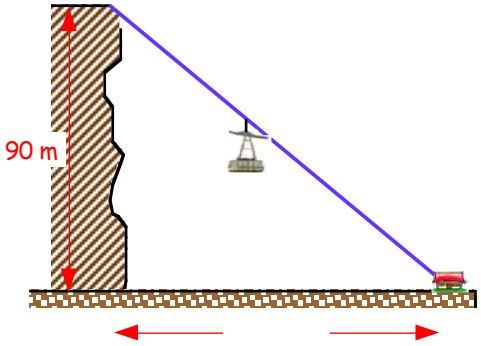
Calculate the length of the ladder.

3. A plane left Edinburgh Airport. The pilot flew 70 kilometres West. He then flew 55 kilometres due North.

Calculate how far away the plane then was from Edinburgh Airport.



4.

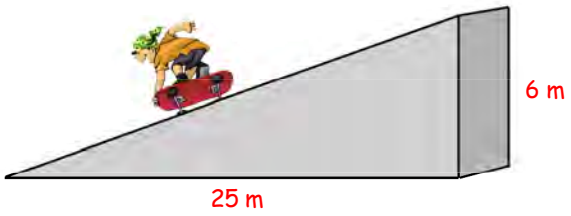


A cable-car, attached to a strong wire cable, is hauled up the mountain.

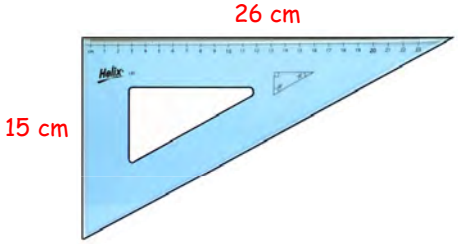
Calculate the length of the cable.

5. Shown is a wooden skateboard ramp.

Calculate the length of the ramp.



6.

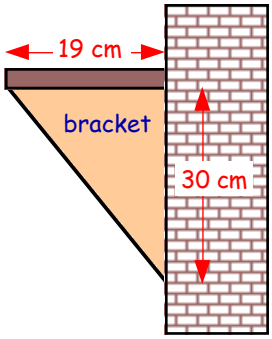


This is a "set square" used in mathematics.

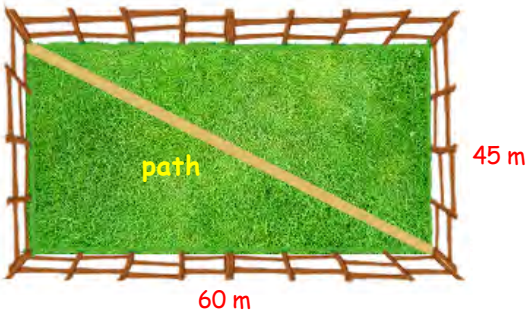
Calculate the length of the longest side.

7. A triangular bracket is fixed to a wall to support a shelf 19 centimetres wide.

Calculate the length of the sloping side of the bracket.



8.



Farmer Wilkes has a field in the shape of a rectangle 60 metres long by 45 metres wide.

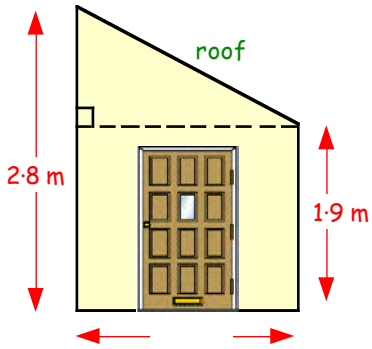
A diagonal path runs across the field.

Calculate the length of the path.

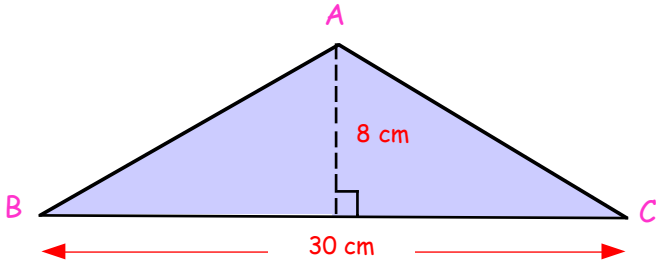
9. The picture shows the side view of a "lean-to" hut.

Calculate the length of the sloping roof.

(*Hint :- just consider the right angled triangle at the top*)



10.



Be careful this time :-

Triangle ABC is **isosceles**.

Calculate the length of the side AB.

(***not*** $c^2 = 8^2 + 30^2$) !!!!!

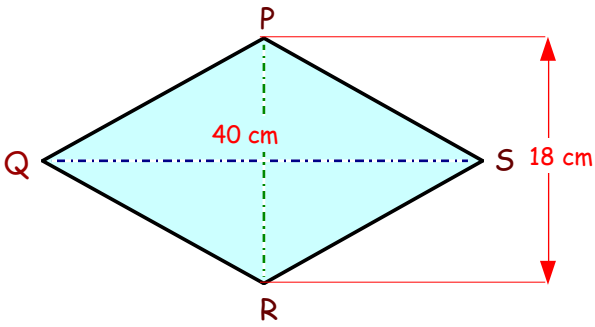
11. PQRS is a **rhombus**.

The long diagonal QS is 40 centimetres.

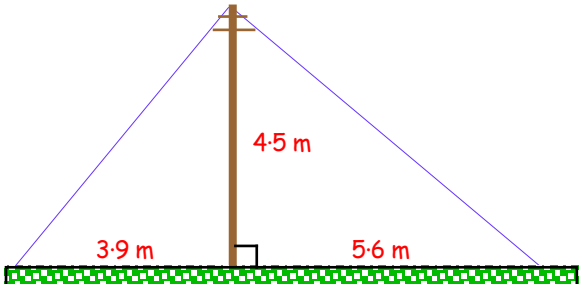
The shorter diagonal PR = 18 centimetres.

Calculate the length of any of its 4 sides.

(*They are all the same length*).



12.



Two wires are used to support a telephone pole as shown in the diagram.

Calculate the **total** length of wire required.

Finding the Length of a Smaller Side (*optional)

This is covered again later in the book.

You can use Pythagoras' Rule to calculate one of the **smaller sides** as follows :-

Can you see this time that to find a smaller side (***a***) :-

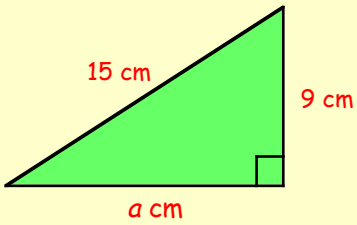
$\Rightarrow \quad a^2 = c^2 - b^2$

$\Rightarrow \quad a^2 = 15^2 - 9^2$

$\Rightarrow \quad a^2 = 225 - 81 = 144$

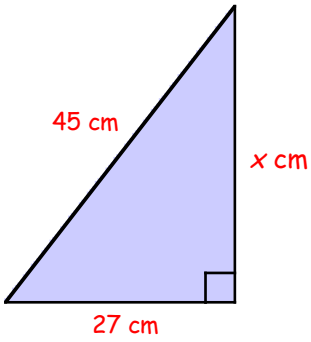
$\Rightarrow \quad a = \sqrt{144} = \mathbf{12\ cm}$

(*Can you see why the "-" sign ?*)



Exercise 6

1. Calculate the length of the side of this right angled triangle marked with an *x*. (*Copy the working as shown*).



$a^2 = c^2 - b^2$

$\Rightarrow \quad x^2 = 45^2 - 27^2$

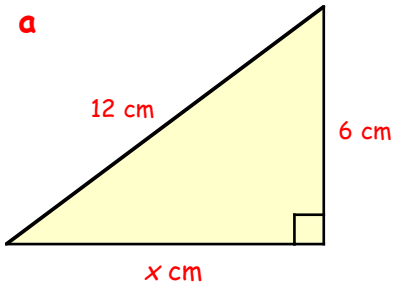
$\Rightarrow \quad x^2 = 2025 - 729$

$\Rightarrow \quad x^2 = 1296$

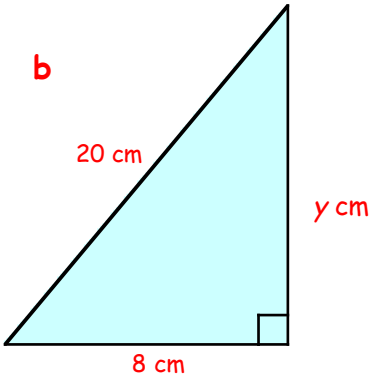
$\Rightarrow \quad x = \ldots.\ \text{cm}$

2. Calculate the size of each of the smaller sides in the following right angled triangles, to 2 decimal places :-

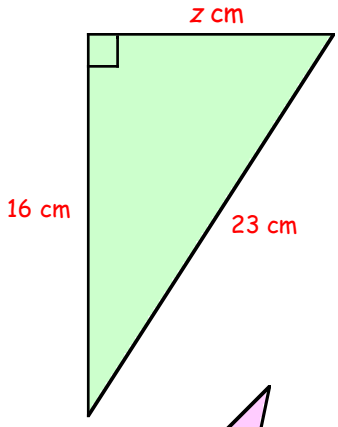
a



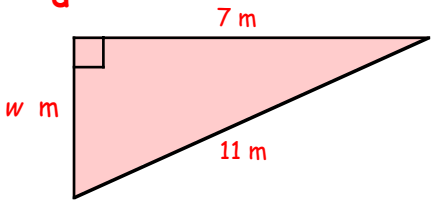
b



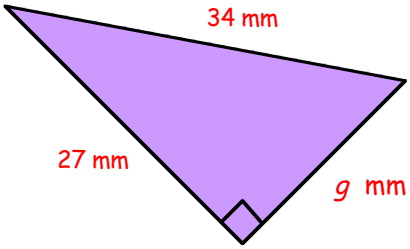
c



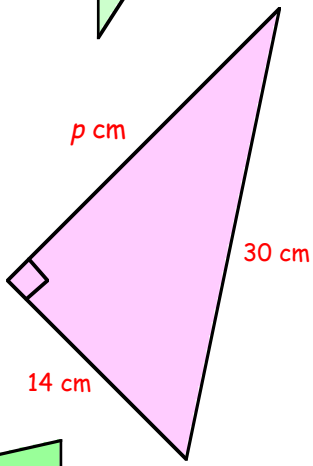
d



e



f



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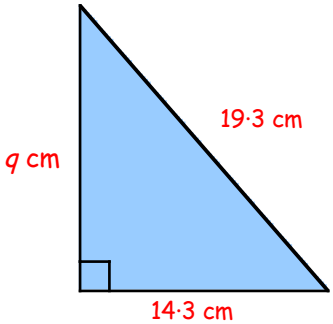
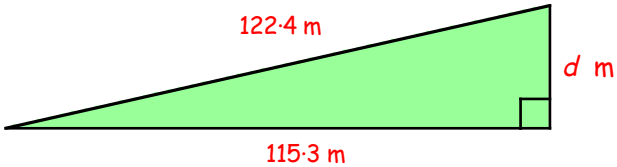


h

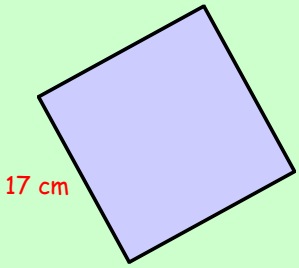


What Have I Learned ?

1. Use a calculator to find the values of :-

a 12^2 **b** 19^2 **c** 43^2 **d** 101^2.

2. Calculate the **area** of this square :-

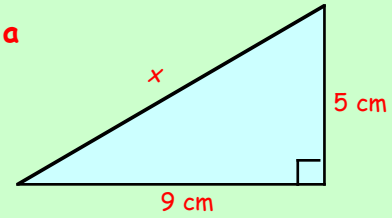


3. Use your calculator to find the following, to **two decimal places** :-

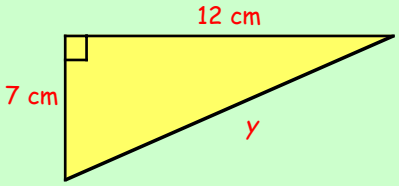
a $\sqrt{40}$ **b** $\sqrt{85}$ **c** $\sqrt{170}$ **d** $\sqrt{18{\cdot}3}$.

4. Calculate the length of the hypotenuse of each right angled triangle :-
(*Give your answers to 1 decimal place*).

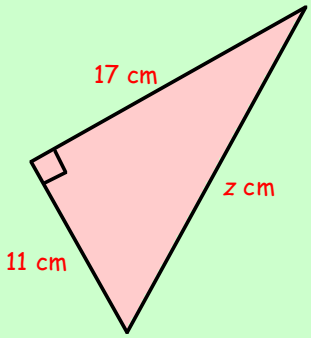
a



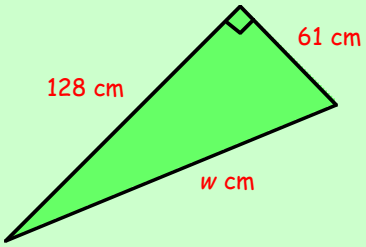
b



c

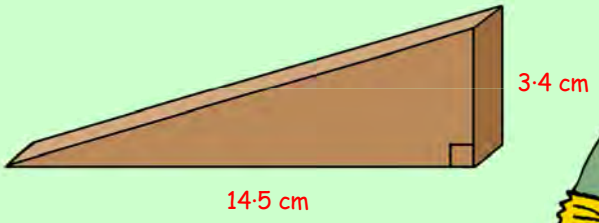


d

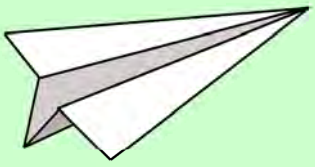


5. The side face of this door wedge is in the shape of a right angled triangle.

Calculate the length of the sloping edge.

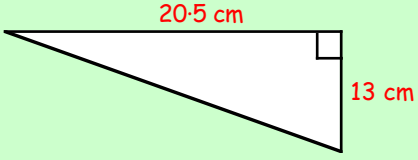


6.



The wing of the paper plane is a right angled triangle.

Calculate the length of the sloping edge.



CHAPTER 14

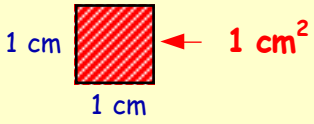
Area

The **AREA** of a shape is defined as :-

the amount of space it takes up.

If you think of a box 1 cm by 1 cm, we say it has an area of :-

or **1 square centimetre** / **1 cm^2** (for short).



(*note :- 1 cm^2 reads as "**1 square centimetre**"*).

Exercise 1

1. **a** How many boxes (1 centimetre by 1 centimetre) are shown here ?

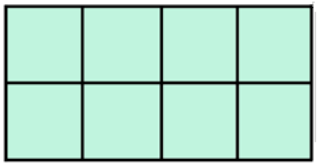
b Write down the area as :- Area = ... cm^2.

2. Write down the areas (use cm^2) of each of the following shapes :-

a

b

c



d

e

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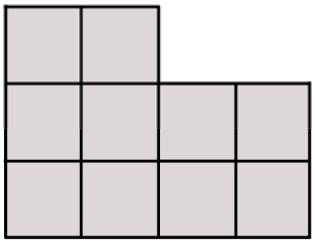

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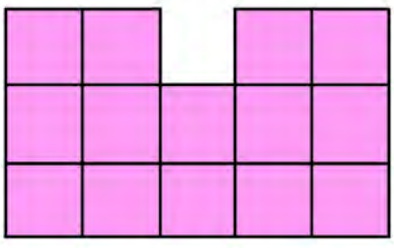

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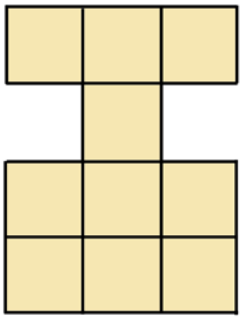
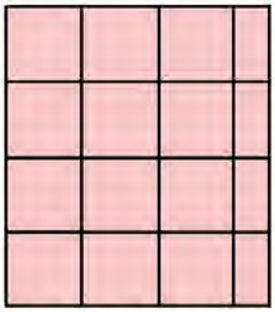
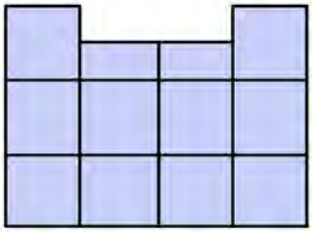


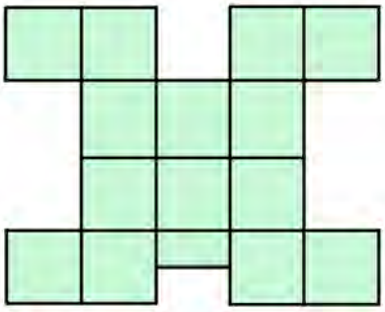
2. **i**



j

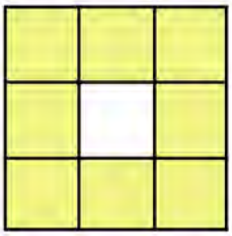


k

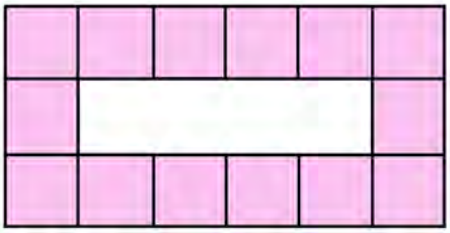


3. Calculate the shaded areas (don't include the holes) :-

a



b



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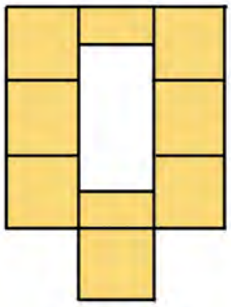

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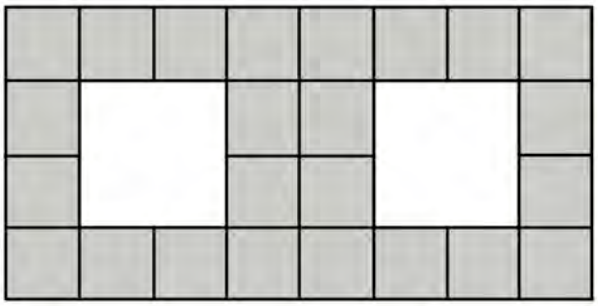
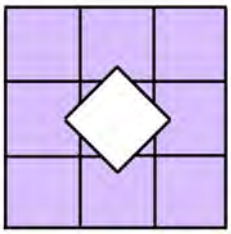


e

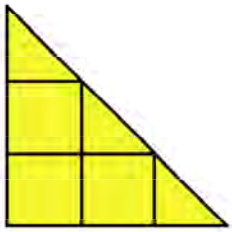


4. **Be careful here with $\frac{1}{2}$ squares !!**

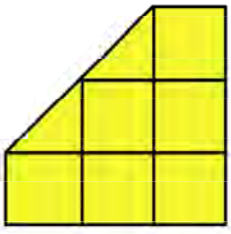
Find the areas of :-

$= \frac{1}{2}$ cm^2

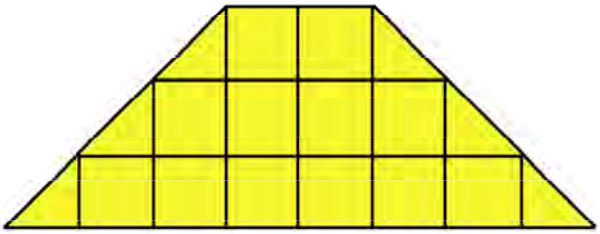
a



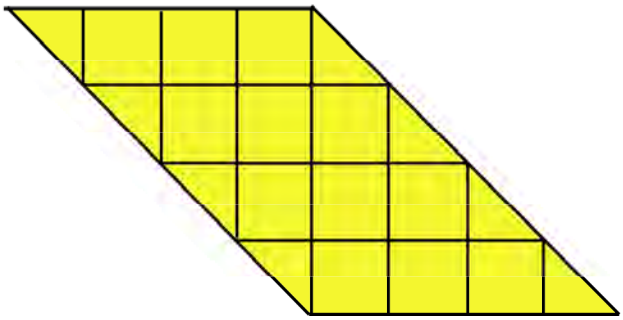
b



c



4. **d**



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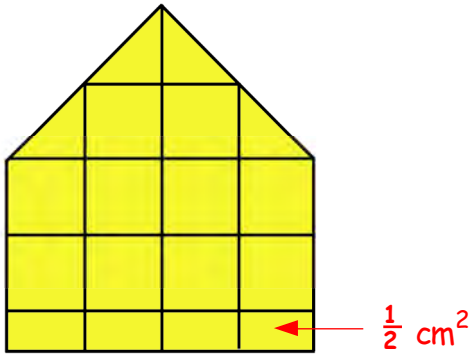

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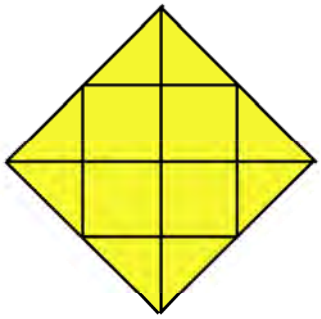
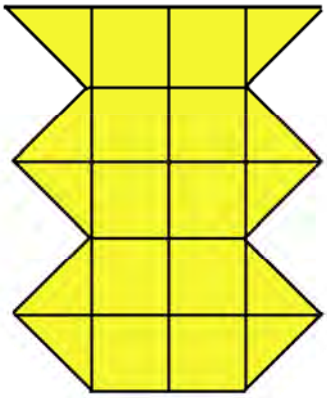


g



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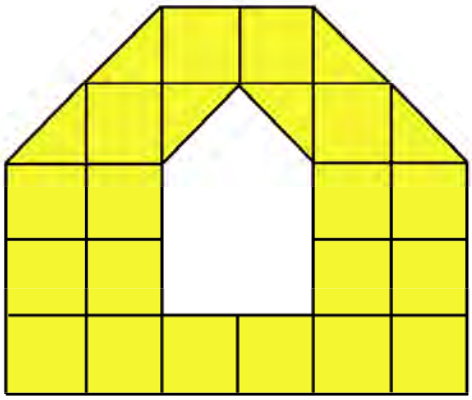
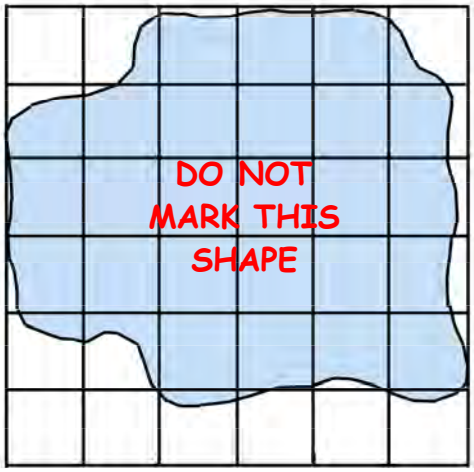


5. Estimate the areas of these shapes as follows :-

If **more** than $\frac{1}{2}$ a box is covered → count it as **1 cm^2**

If **less** than $\frac{1}{2}$ a box is covered → do **not** count it at all

a



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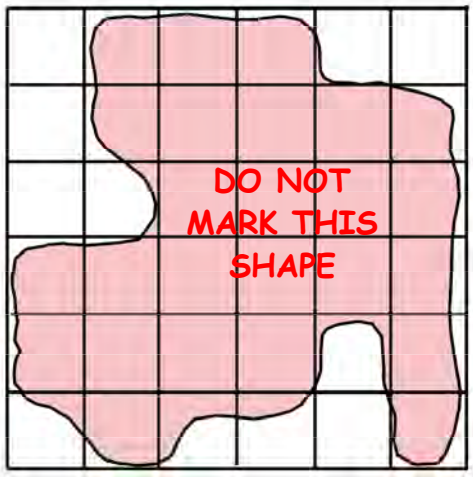
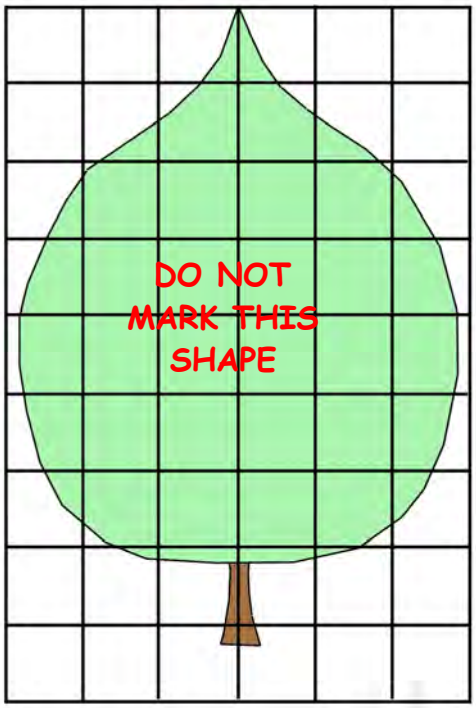
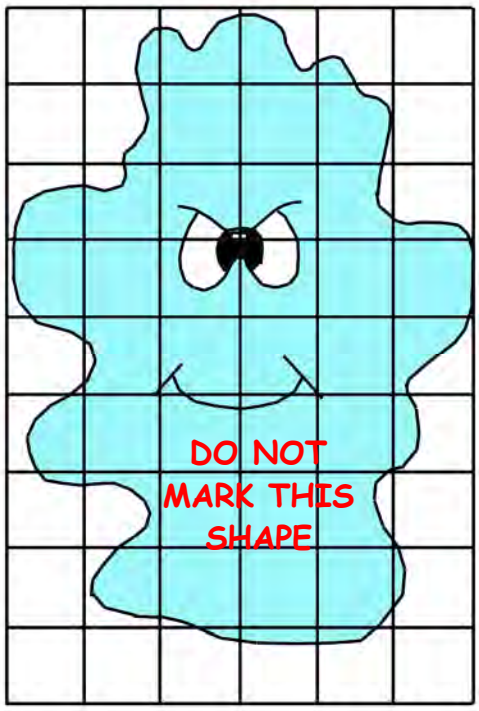


5. c

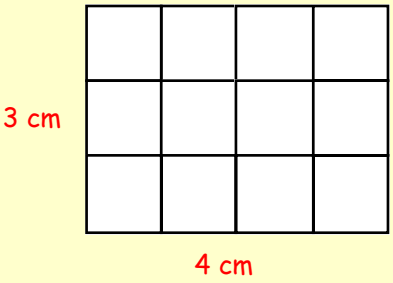


d



Area of a Rectangle (a Formula)

This rectangle measures 4 centimetres by 3 centimetres.



a Calculate its **area** (in cm^2) by **counting** all the boxes.

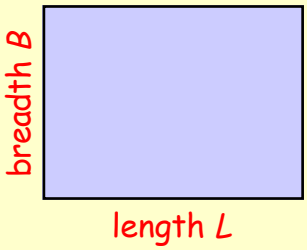
b Now write down the answer you get when you **multiply** its length by its breadth :-

=> 4 cm x 3 cm (do you get the same answer ?)

A really simple way of calculating the **area** of a rectangle is as follows :-

Area = length x breadth

or **$A = L \times B$** for short.



It is VERY important that you learn how to use the formula,

$A = L \times B$ when calculating the **area** of a rectangle.

Exercise 2

No calculator in this exercise until Question 5.

1. **a** Draw a rectangle 5 centimetres long by 2 centimetres wide.

b Divide the rectangle neatly into 1 cm square boxes and count the boxes to find the area of the rectangle.

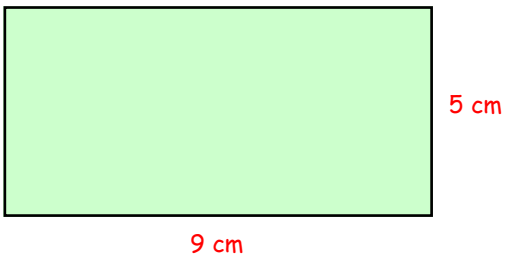
c Use the formula $A = L \times B$ (with $L = 5$, $B = 2$) to calculate the **area** and check your answer is the same as that obtained in part **b**.

2. This is a sketch of a rectangle.

Use the formula

$$A = L \times B$$

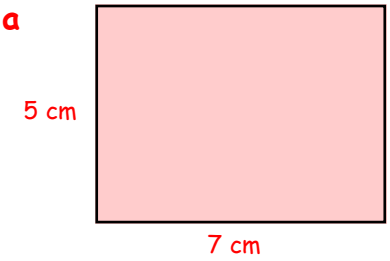
to calculate its **area** (in cm^2).



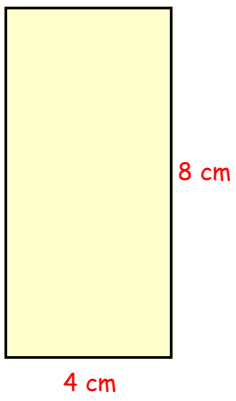
3. Calculate the area of each of the following rectangles.

(In each case, make a small "sketch" of the rectangle, write down the rule $A = L \times B$ and calculate the **area** in cm^2) :-

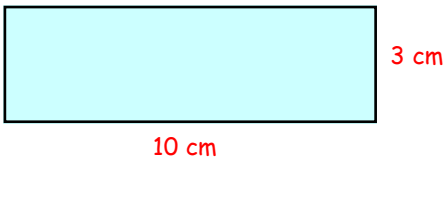
a



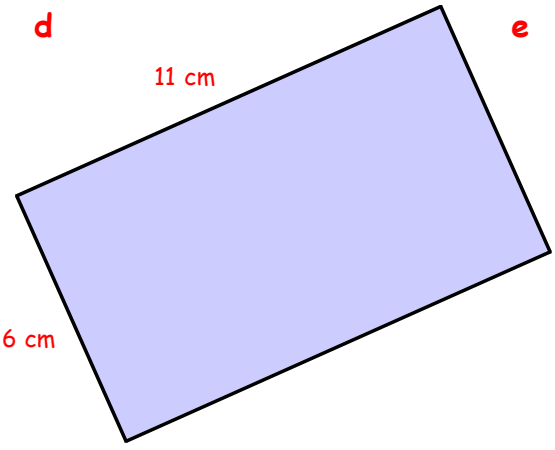
b



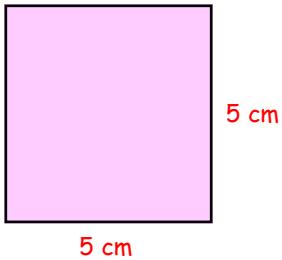
c



d



e



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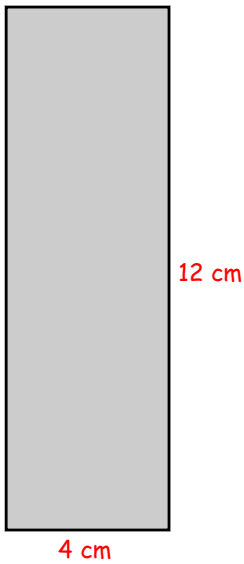
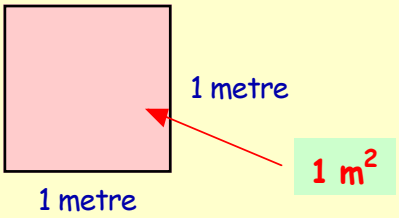


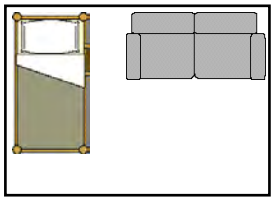
If the length and breadth are in metres,
then the area will be in **square metres**.

The **area** of this box would be **1 m²**.

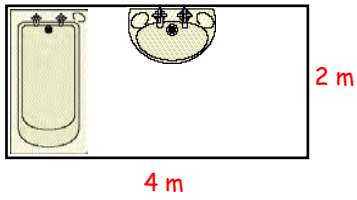


4. Use your formula **A = L × B** to calculate the **areas** of these rooms in square metres :-

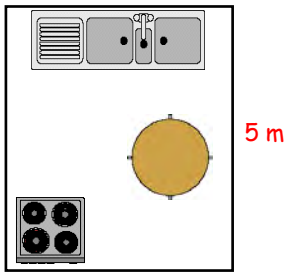
a



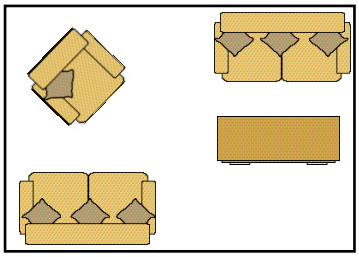
b



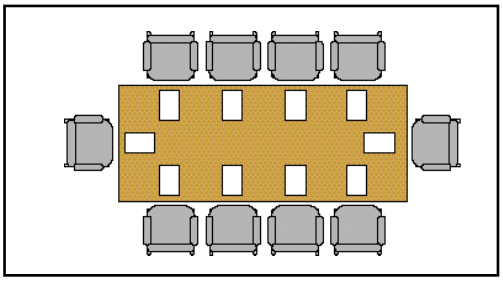
c



d



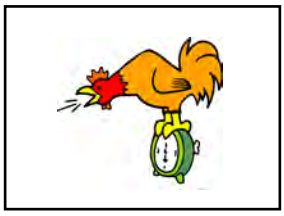
e



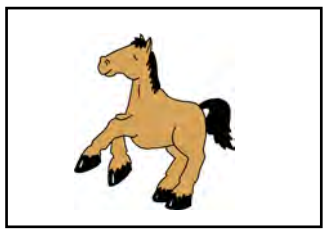
5. Calculate the **areas** of these rectangular fields in **m²** :-
(*You may use a calculator here*).

a

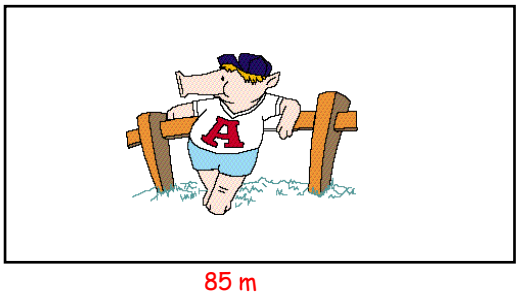
b



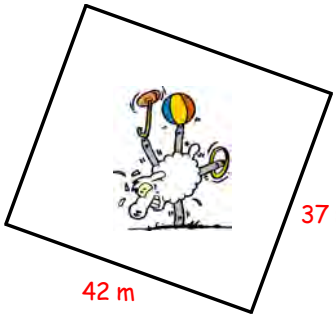
c



d



e

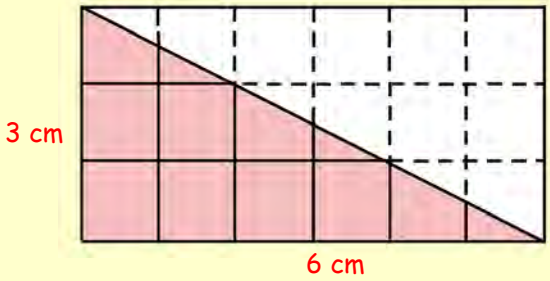


Area of a Right Angled Triangle

To calculate the **area** of a Right Angled Triangle :-

Step 1 – Look at the surrounding rectangle
=> **Area** = 6 × 3 = 18 cm^2.

Step 2 – **Halve** your answer =>
=> **Area** = $\frac{1}{2}$ of 18 = **9** cm^2.



Exercise 3

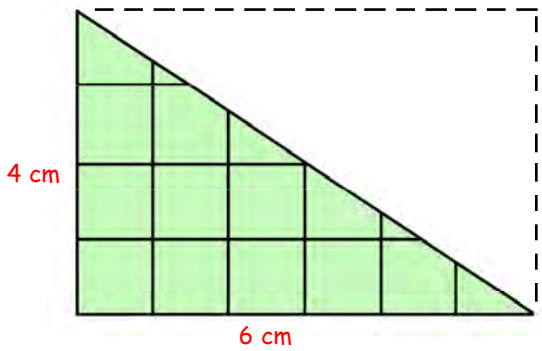
1.

a Make an accurate drawing of this right angled triangle.

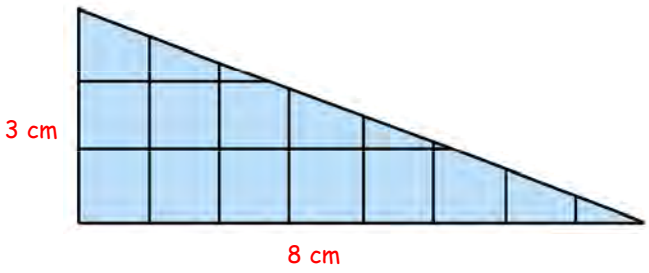
b Complete the figure by drawing the surrounding rectangle.

c Calculate the area of the rectangle.

d Now write down the area of the triangle.



2.



a Make an accurate drawing of this right angled triangle.

b Complete the figure by drawing the surrounding rectangle.

c Calculate the area of the rectangle.

d Now write down the area of the triangle.

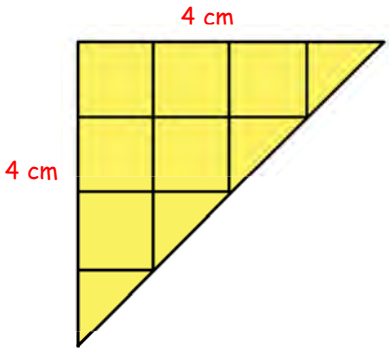
3.

a Make an accurate drawing of this right angled triangle.

b Complete the figure by drawing the surrounding square.

c Calculate the area of the square.

d Now write down the area of the triangle.

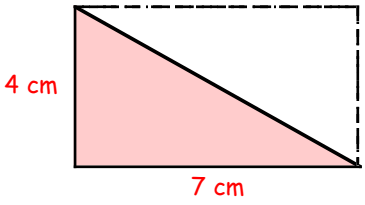


4. For the following right angled triangles :-

(i) Make a small neat sketch **(ii)** Draw the surrounding rectangle

(iii) Find the area of the rectangle **(iv)** Calculate the area of the triangle.

a

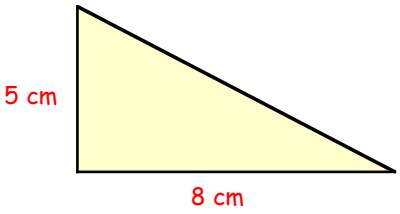


Area (**rectangle**) = $L \times B$ = 4×7

= 28 cm^2

Area (**triangle**) = $\frac{1}{2}$ of 28 = ... cm^2

b



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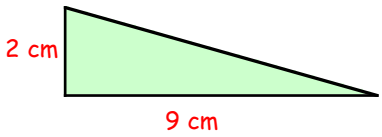

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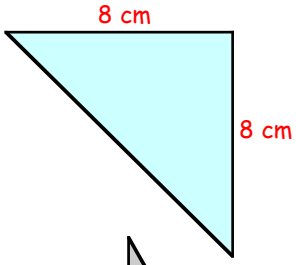

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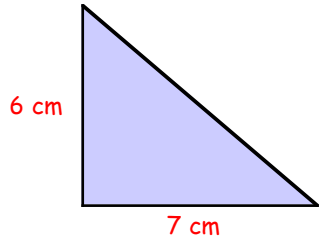

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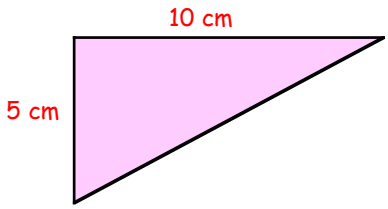
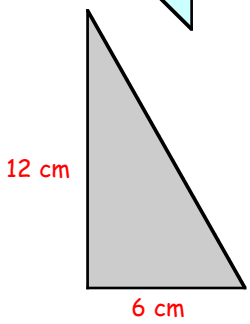


g



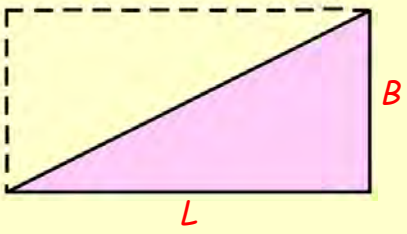
A Formula (rule) for the Area of a Right Angled Triangle

Remember :- the **area** of a rectangle is given by :-

$A = L \times B$

The **area of a triangle** is therefore given by :-

Area = $\frac{1}{2}$ length x breadth or **$A = \frac{1}{2}(L \times B)$**

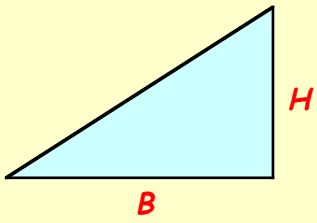


New Formula :- the sides of a triangle are **not** normally labelled L and B.

Base (B) and **Height** (H) are used.

The **area of a triangle** is now given by :-

$A = \frac{1}{2}(B \times H)$



To be learned !!!

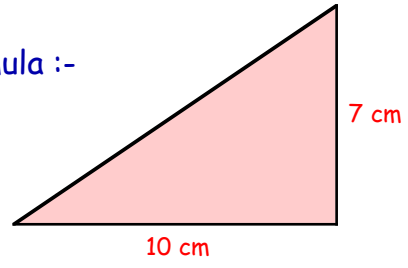
5. **a** Make a small (neat) sketch of this triangle.

b Copy this working and calculate its area using the formula :-

$A = \frac{1}{2}(B \times H)$

$\Rightarrow$ $A = \frac{1}{2}$ of (10×7)

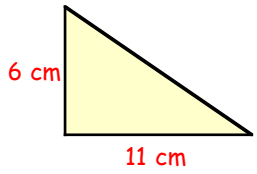
$\Rightarrow$ $A =$ .... cm^2



6. Make a **sketch** of each right angle triangle using a ruler).

Use the formula to calculate the **area** each time.

a

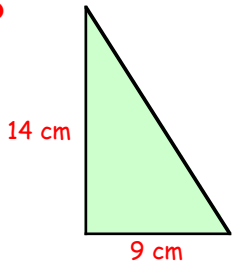


$A = \frac{1}{2}(B \times H)$

$\Rightarrow A = \frac{1}{2}$ of (11×6)

$\Rightarrow A =$ ..... cm^2

b

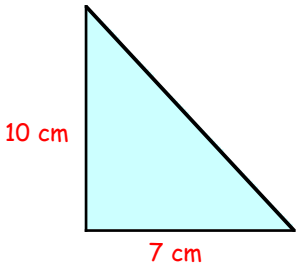


$A = \frac{1}{2}(B \times H)$

$\Rightarrow A = \frac{1}{2}$ of $(9 \times ....)$

$\Rightarrow A =$ ..... cm^2

c



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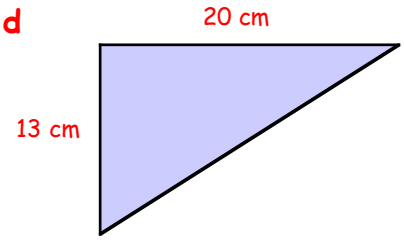

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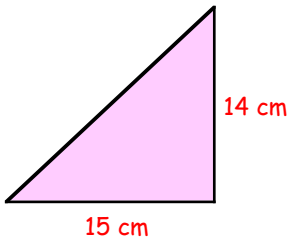

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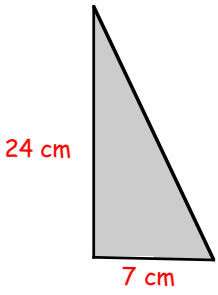

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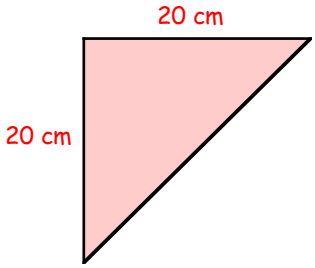

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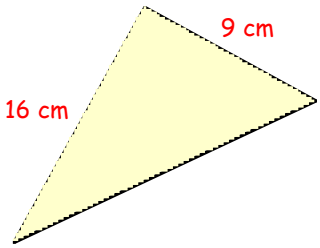

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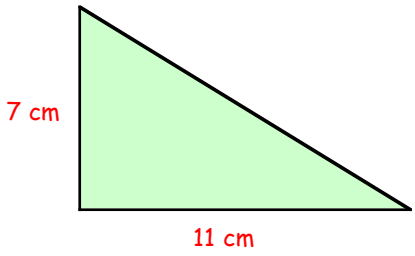
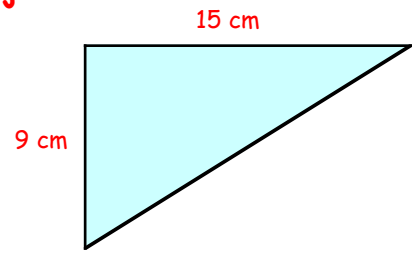
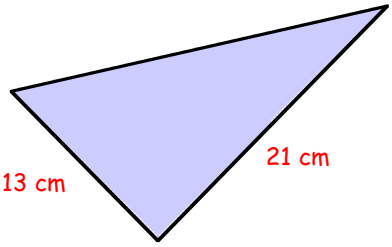


j



k



Remember :-

If the length and breadth are in **cm** => Area is in cm^2.

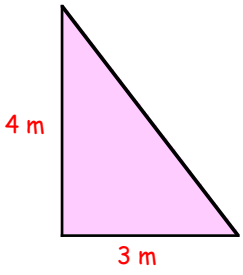
If the length and breadth are in **mm** => Area is in mm^2.

If the length and breadth are in **m** => Area is in m^2.

7. Calculate the **areas** of these **right angled triangles** (in mm^2, cm^2 or m^2) :-

(*Use the formula each time*)

a

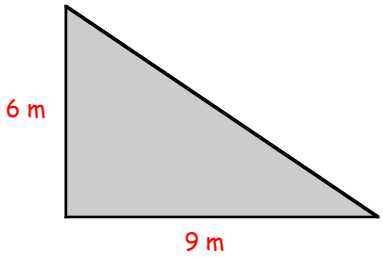


$A = \frac{1}{2}(B \times H)$

$\Rightarrow A = \frac{1}{2}$ of (3×4)

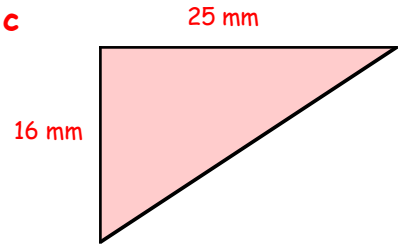
$\Rightarrow A =$ ..... m^2

b



7.

c



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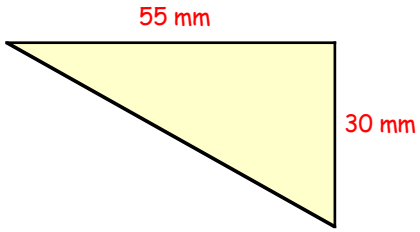

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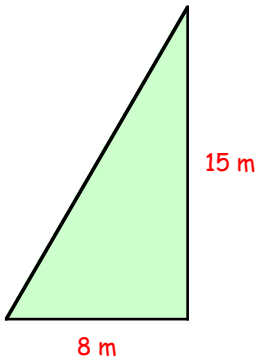

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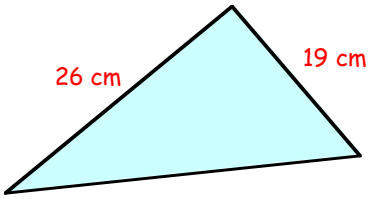

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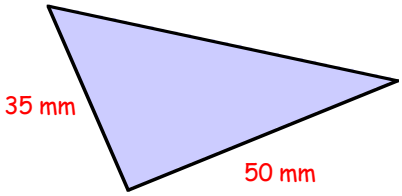

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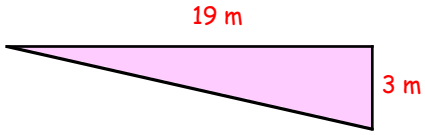
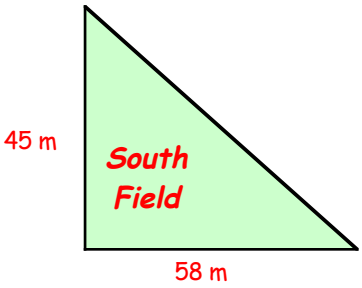
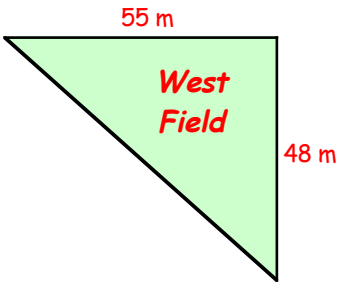


8. Farmer McDougall has 2 fields to plough.

Each field is in the shape of a right angled triangle.

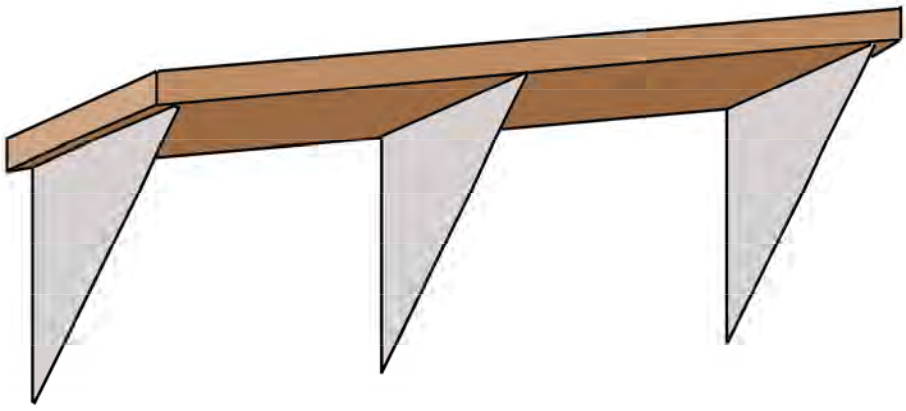


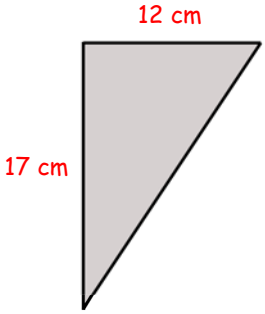


a Which of the 2 fields has the larger area ?

b By how much is one field **larger** than the other ?

9. Three identical metal brackets are used to support a shelf.



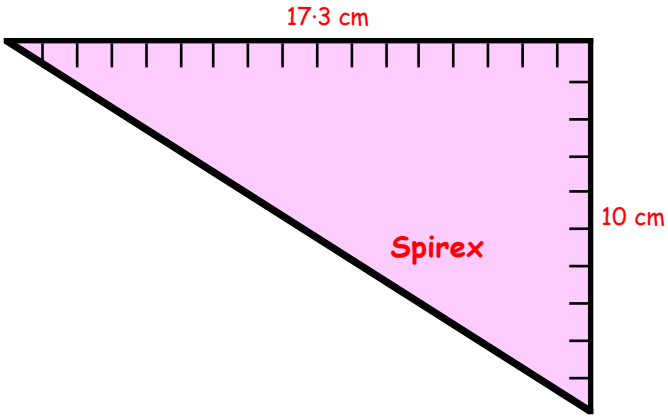


Each bracket is a right angled triangle.

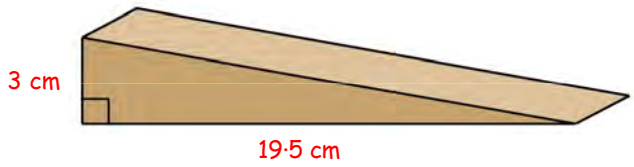
Calculate the **total area** of metal needed to make all 3 brackets.

10. A plastic set-square measures 17·3 cm by 10 cm.

Calculate the **area** of the plastic.



11.

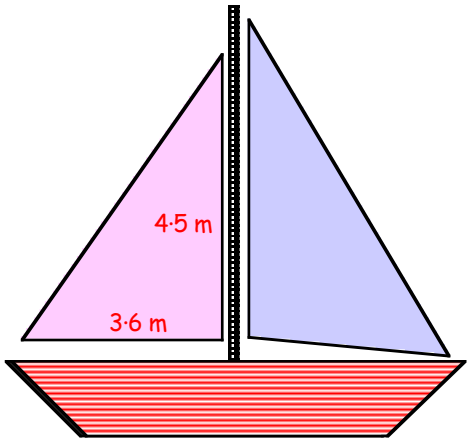


This side view of a wooden door wedge shows the height is 3 cm and the length is 19·5 cm.

Calculate the **area** of the front face.

12. The pink sail of this yacht is in the shape of a right angled triangle.

Calculate its **area** in m^2.



Area of any Triangle

The formula (or rule) :- **Area** = $\frac{1}{2}(B \times H)$ works for **all** triangles.

(*Not just right angled triangles*).

Can you see in this figure that the area of the triangle below can be found as follows :-

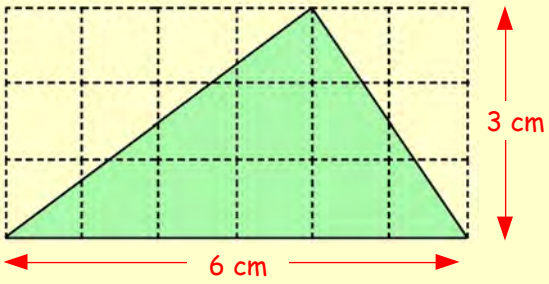
Area $_{(\text{rect})}$ = $L \times B$ = 6×3

= **18 cm²**

Area $_{(\text{triangle})}$ = $\frac{1}{2}(B \times H)$ = $\frac{1}{2}$ of (6×3)

= $\frac{1}{2}$ of 18

= **9 cm²**



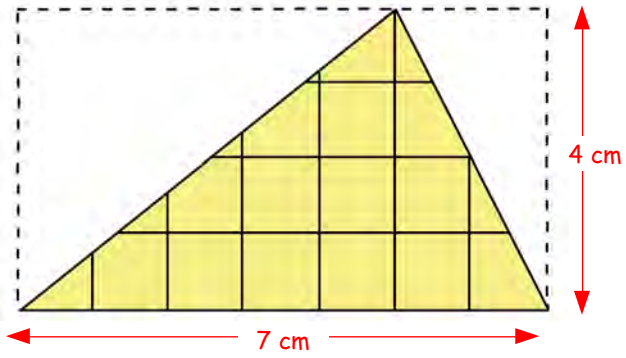
Exercise 4

1. **a** Make an accurate drawing of this triangle.

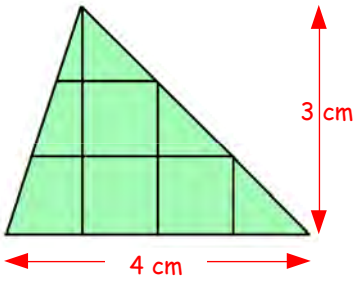
b Draw the surrounding rectangle.

c Calculate the area of the rectangle.

d Now write down the area of the triangle.



2.



a Make an accurate drawing of this triangle.

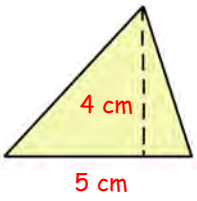
b Draw the surrounding rectangle.

c Calculate the area of the rectangle.

d Now write down the area of the triangle.

3. Use the formula **Area** = $\frac{1}{2}(B \times H)$ each time to calculate the areas of the following triangles (*make a neat sketch of each triangle*) :-

a

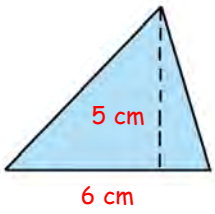


$A = \frac{1}{2}(B \times H)$

$\Rightarrow A = \frac{1}{2}$ of (5×4)

$\Rightarrow A =$ ..... cm^2

b

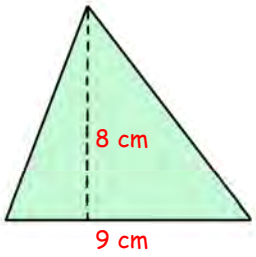


$A = \frac{1}{2}(B \times H)$

$\Rightarrow A = \frac{1}{2}$ of $(6 \times ...)$

$\Rightarrow A =$ ..... cm^2

c



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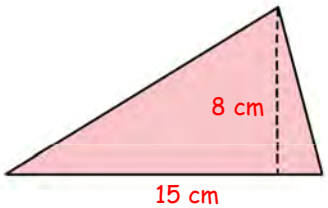

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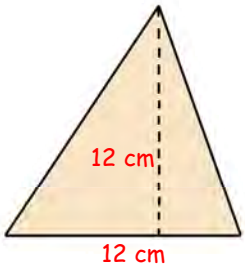

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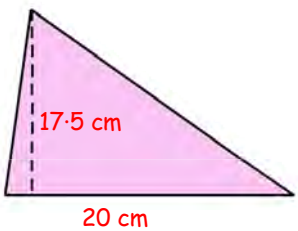

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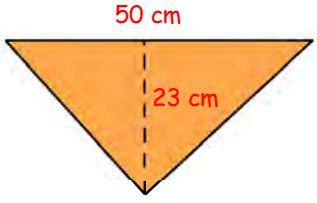

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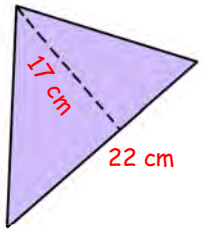
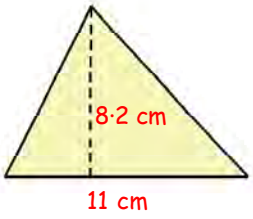


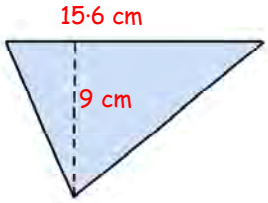
4. Calculate the **area** of each of the following triangles :-

You must write down the formula and show your working. (*No need to sketch*).

a



b



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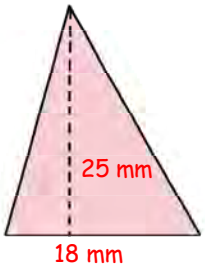

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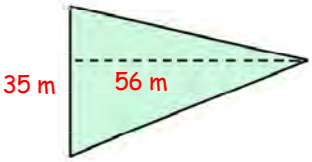

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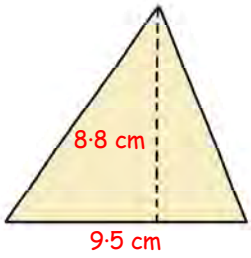

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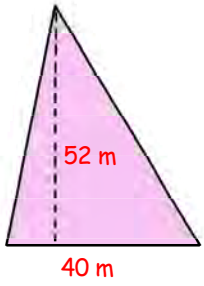

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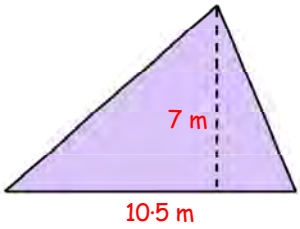

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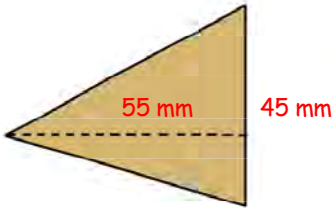

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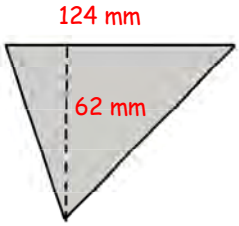
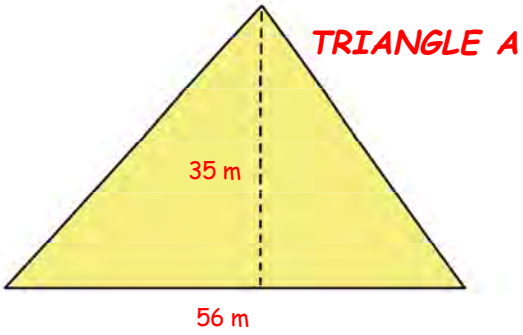
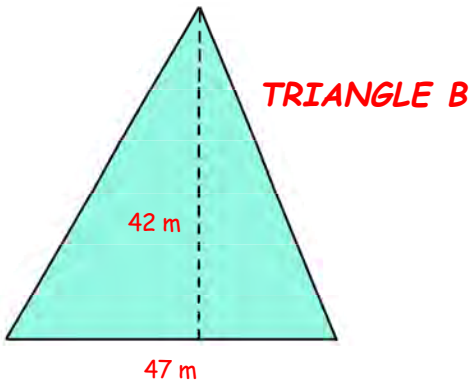
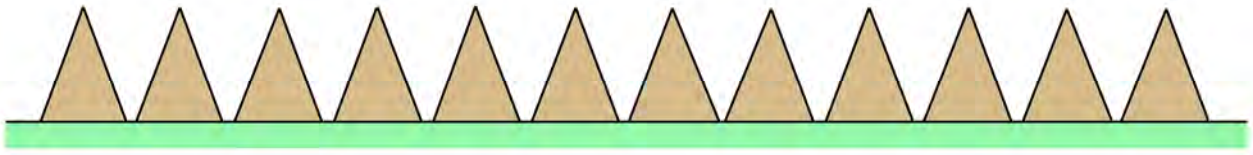


5. Which of these triangles has the **bigger** area ?



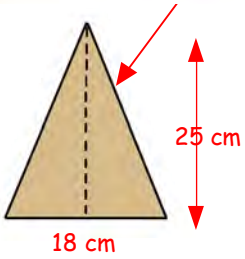


6. Triangular wooden fencing is used to edge a lawn.



Each triangle measures 18 cm wide by 25 cm high.

Calculate the **total area** of wood required to make all 12 triangular edging pieces.

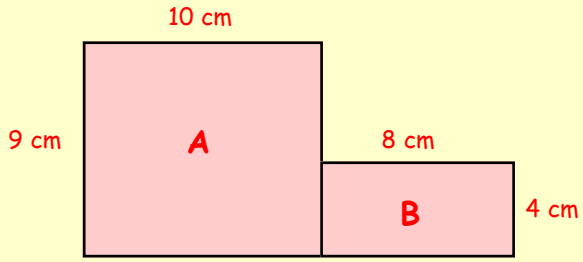


Composite Areas

If a shape is made up of 2 (or more) rectangles, to find its area, simply :-

Step 1 Calculate the area of each rectangle.

Step 2 Add the areas together.



=> Area (of A) = $L \times B = 10 \times 9 = 90$ cm^2

=> Area (of B) = $L \times B = 8 \times 4 = 32$ cm^2

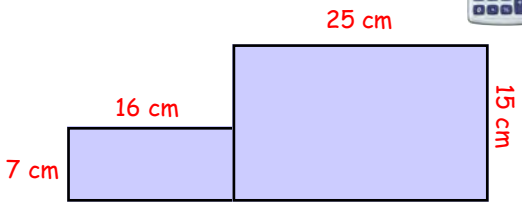
=> **Total** Area = 90 + 32 = **122 cm^2**

Exercise 5

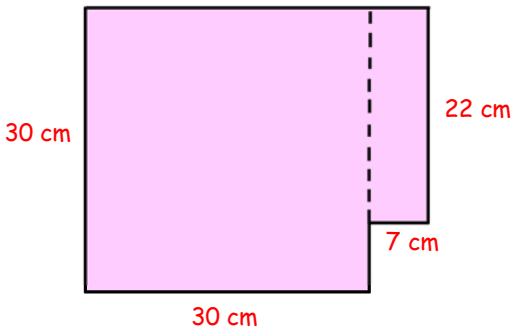
1. **a** Calculate the area of the big rectangle.

b Calculate the area of the small rectangle.

c Calculate the **total** area of the shape.



2.



a Calculate the area of the square.

b Calculate the area of the rectangle.

c Calculate the **total** area of the shape.

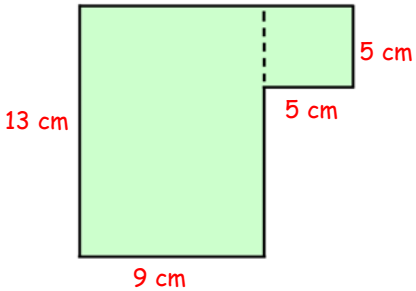
3. For each of these shapes :-

(i) make a neat sketch

(ii) calculate the area of each part (*show working*)

(iii) calculate the area of the whole shape.

a

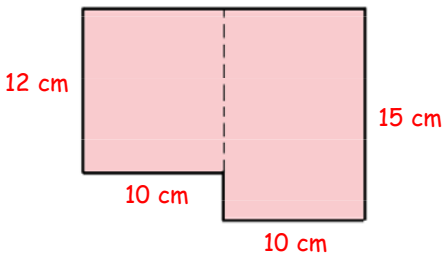


Area of square = $L \times B = 5 \times 5 =$ .... cm^2

Area of rectangle = $L \times B = 9 \times ? =$ .... cm^2

=> **Total** Area = ... + ... = ... cm^2

3. **b**



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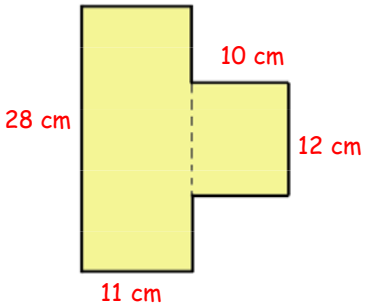

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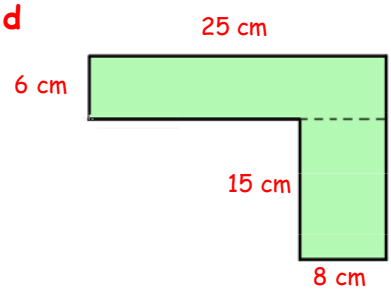

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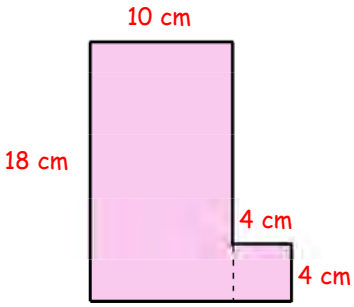

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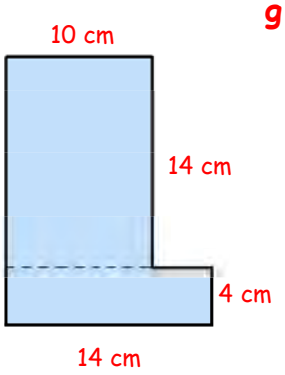
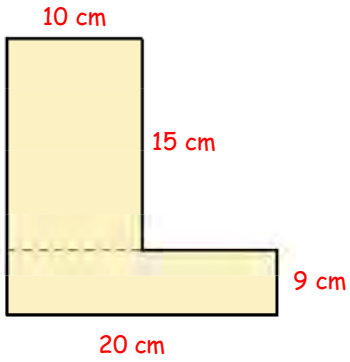


g



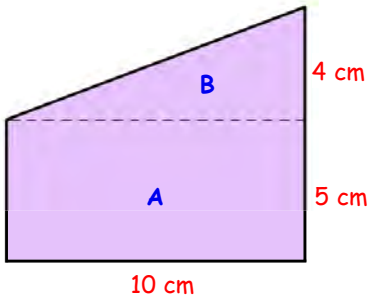
4. This shape consists of a rectangle and a right angled triangle.

Copy the working and complete it :-

Area of rectangle A = $L \times B$ = 10 × 5 = ... cm^2

Area of triangle B = $\frac{1}{2}(B \times H)$ = $\frac{1}{2}$ of 10 × 4 = ... cm^2

=> **Total Area** = ... + ... = ... **cm^2**

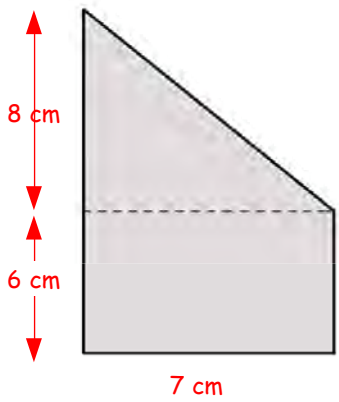


5. Copy and complete :-

Area of rectangle A = $L \times B$ = 7 × .... = ... cm^2

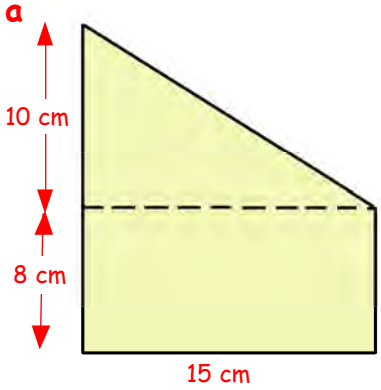
Area of triangle B = $\frac{1}{2}(B \times H)$ = $\frac{1}{2}$ of 7 × .... = ... cm^2

=> **Total Area** = ... + ... = ... **cm^2**

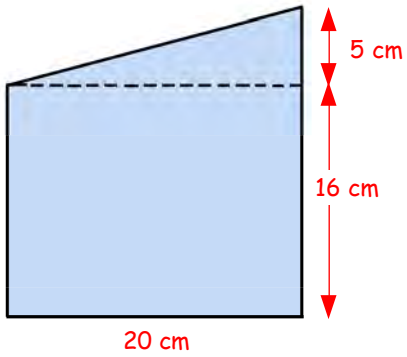


6. For each shape here, calculate the area of the rectangle, the area of the right angled triangle and the total area of the shape :-

a



b



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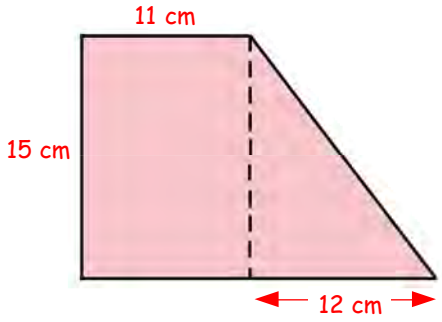

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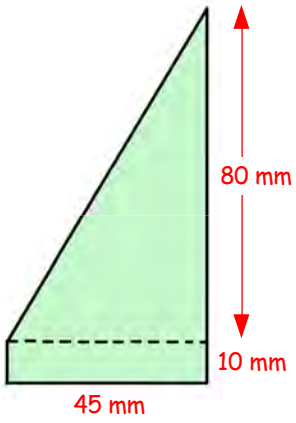
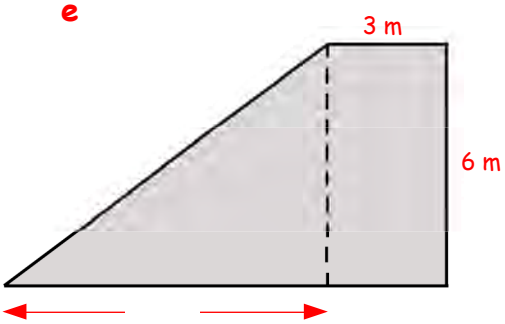


e



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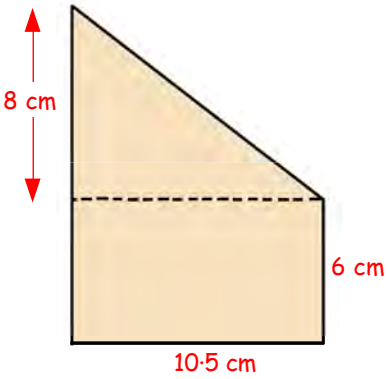
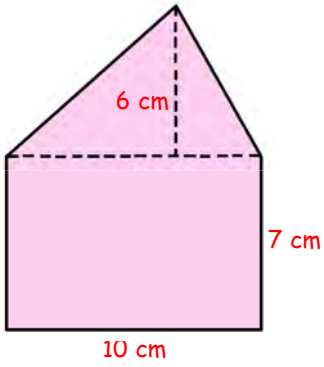
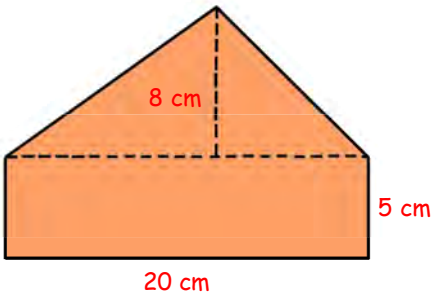


7. Calculate the total area of each of the following shapes :-

a



b



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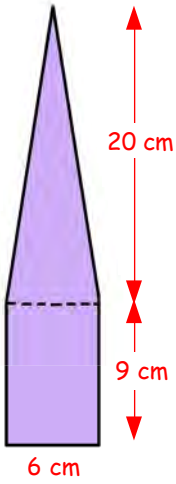

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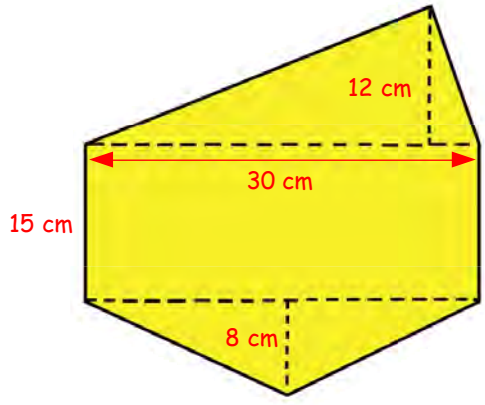
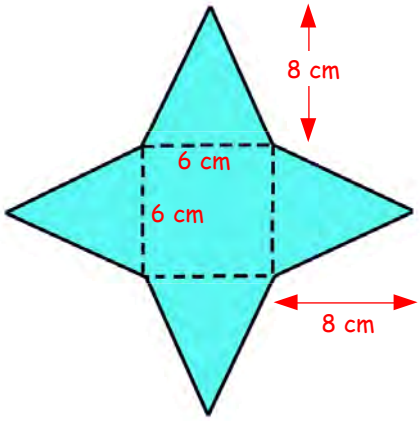
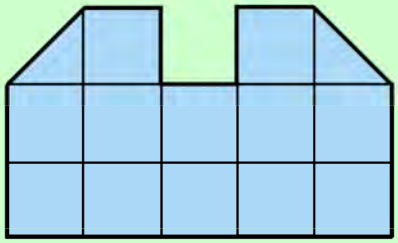


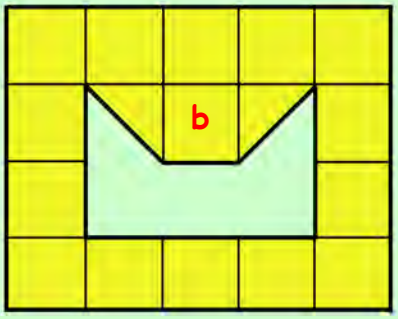
e



What Have I Learned ?

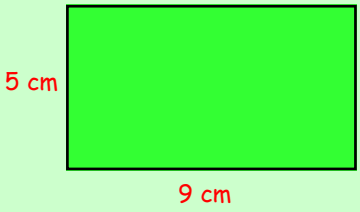
1. Write down the area of shape **a** and the area of the yellow part of shape **b**.



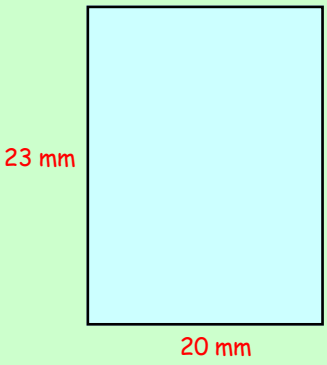


2. Calculate the areas of these rectangles :- (*Show your working*).

a



b



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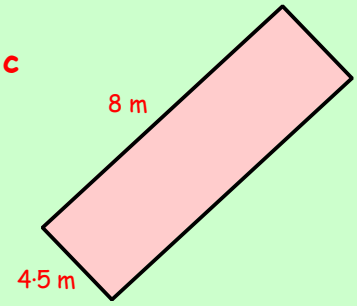
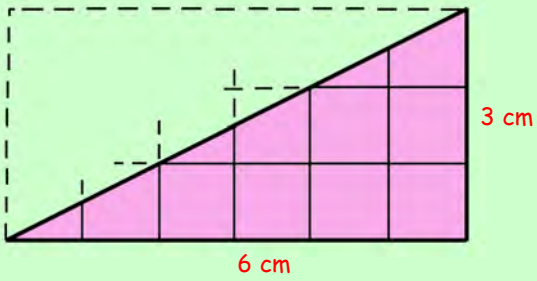


3. Write down the area of :-

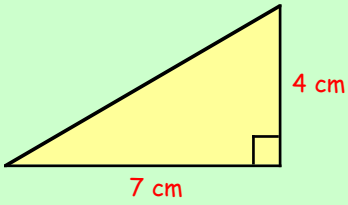
a the large rectangle.

b the pink right angled triangle.

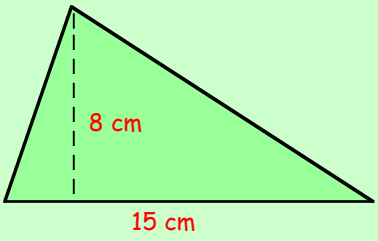


4. Calculate the areas of these triangles :- (*Show your working*).

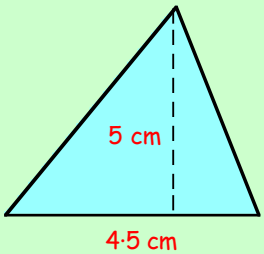
a



b

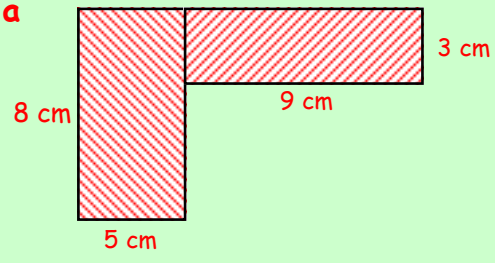


c

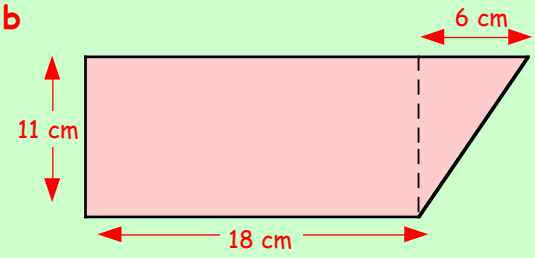


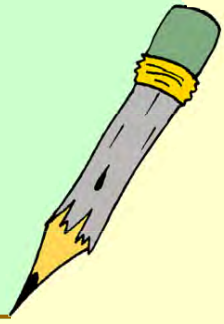
5. Calculate the areas of these two shapes :- (*Show your working*).

a



b





CHAPTER 15

Percentages (Revised)

Remember -

50%	= $\frac{1}{2}$	(means ÷ 2)
25%	= $\frac{1}{4}$	(means ÷ 4)
$33\frac{1}{3}$%	= $\frac{1}{3}$	(means ÷ 3)
10%	= $\frac{1}{10}$	(means ÷ 10)
1%	= $\frac{1}{100}$	(means ÷ 100)

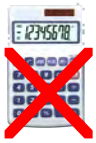
a couple more -

75%	= $\frac{3}{4}$	(means ÷ 4 **then** × 3)
$66\frac{1}{3}$%	= $\frac{2}{3}$	(means ÷ 3 **then** × 2)

even more -

20%	= $\frac{2}{10}$ (or $\frac{1}{5}$)	(means ÷ 10 **then** × 2)
30%	= $\frac{3}{10}$	(means ÷ 10 **then** × 3)
40%	= $\frac{4}{10}$ (or $\frac{2}{5}$)	(means ÷ 10 **then** × 4)
60%	= $\frac{6}{10}$ (or $\frac{3}{5}$)	(means ÷ 10 **then** × 6)
70%	= $\frac{7}{10}$	(means ÷ 10 **then** × 7)
80%	= $\frac{8}{10}$ (or $\frac{4}{5}$)	(means ÷ 10 **then** × 8)
90%	= $\frac{9}{10}$	(means ÷ 10 **then** × 9)
5%	= $\frac{1}{2}$ of 10%	(means ÷ 10 **then** ÷ 2)

Exercise 1



1. Do the following (mentally if possible) – use the above to help :-

a	50% of £160	**b**	25% of £1·20	**c**	$33\frac{1}{3}$% of £1800
d	10% of £360	**e**	20% of £90	**f**	25% of £2·40
g	$33\frac{1}{3}$% of £150	**h**	50% of £9	**i**	10% of 80p
j	30% of £70	**k**	20% of £190	**l**	75% of £40
m	$66\frac{2}{3}$% of £90	**n**	100% of £7·50	**o**	40% of £120
p	90% of £60	**q**	1% of £3500	**r**	75% of £4000
s	10% of £640	**t**	5% of £640	**u**	$66\frac{2}{3}$% of £3·60
v	70% of £80	**w**	80% of £2	**x**	2% of £600

2. A dress is priced at £150.

In a sale there is a **discount** of $33\frac{1}{3}$%.

a Calculate the discount.

b Calculate the sale price of the dress (*£150, less the discount*).

3. I bought £800 of shares in "Sparks & Mencers".

Last year their value **grew** by 30%.

a By how much in value did they grow ?

b Calculate the new value of the shares.

4.

Last year, Jenny's salary was £16 000.

She received a **rise** of 5% this year.

a Calculate her rise (*find 10% and half it*).

b Calculate her new salary.

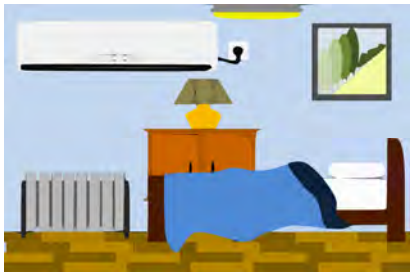
5. A tank contained 120 litres of oil.

Mr Jones burned 75% of the oil last winter to heat his house.

a How many litres did he burn ?

b How many litres were left ?

6.



The temperature in a room at dawn was 16°C.

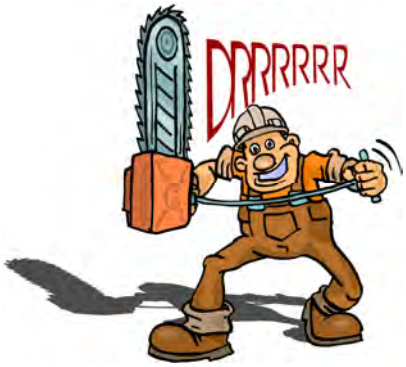
By 10 am, the temperature had risen by 25%.

a By how many degrees had the temperature risen ?

b Calculate the new temperature at 10 am.

7. A tree was 20 metres tall.

Its owner decided to chop off 30% of it.



a How many metres were chopped off ?

b What was the new height of the tree ?

8. **a** Which is bigger :- 25% of 300 **or** $33\frac{1}{3}$% of 240 ?

b By how much is one bigger than the other ?

9. Ryan's maths test was marked out of 80.

He got a mark of 75%.

What was Ryan's score out of 80 ?

10. 

An old people's home has 60 men and 90 women staying there.

80% of the men and $66\frac{2}{3}$% of the women went on a bus tour.

How many residents altogether went on the trip ?

Profit and Loss

If you buy a car for £7800 and sell it for £6500
you are said to have "made a **LOSS** of £1300".

If you buy a flat for £64 000 and sell it for £77 000
you are said to have "made a **PROFIT** of £13 000".

Profit = **Selling Price** - **Buying Price** (*if selling price > buying price*).

Loss = **Buying Price** - **Selling Price** (*if buying price > selling price*).

Exercise 2

1. I bought a racing bike for £350 and
sold it 1 year later for £260.

How much of a **loss** did I make ?

2. I bought a pair of football boots for £32·50 and sold them to a friend for £20.

How much of a loss did I make ?

3. 

A man bought a painting for £12 000.

He sold it to a private collector for £18 500.

How much of a profit did he make ?

4. John built his own detached house for a total cost of £141 750.

He advertised it and managed to sell it for £163 450.

How much of a **profit** did John make ?

5. Claire bought an exercise bike for £120 and a rowing machine for £195.

One year later she sold the bike for £65 and the rowing machine for £88.

How much of a **loss** did she make altogether ?

6.

I bought 2 second hand office chairs for a **total** of £45.

I sold the "good" chair for £32 and the other for £19·50.

How much **profit** did I make altogether ?

7. I bought a second hand Vauxhall Astra for £4250.

When I sold it one year later, I found I had made a **loss** of £950.

For how much did I sell the car ?

8.

I bought a red piano for £375.

When I sold it 2 years later I did so at a **profit** of £120.

How much did I receive for the piano ?

9. I bought an old bicycle for £15.

It cost me £12·50 for 2 new tyres and £6·75 for a new chain.

a How much did the bicycle cost me altogether ?

b If I then sold the bicycle for £55, how much **profit** did I make ?

10. A small shopkeeper (the shop was small – not the man) bought a box of 10 large Easter eggs for a **total** of £32·50.

He sold **each** egg for £4·50.

How much **profit** did he make altogether after selling all 10 eggs ?

11. "Tie Rack" in Edinburgh bought a box of 6 identical ties for £49·50.

The ties were all sold at £11·50 each.

How much **profit** was made when all the ties were sold ?

12. "Popworld" Record Shop bought 20 copies of the new "Hearwhat" C.D. for a total of £195.

They managed to sell all 20 copies at £11·50 each.

How much of a profit was made on the 20 C.D.'s ?

13. A shop bought 50 "Reindeer Antler" hats in November for a total cost of £75.

They sold 30 of them before Christmas at £2·50 each.

The other 20 were sold after Christmas at 60p each.

a How much money was made when all 50 were sold ?

b How much profit was made ?

14. A man bought a small publishing company in 1990 for £60 000.

In 2012, he sold the successful company for £1 500 000 (£1$\frac{1}{2}$ million).

How much profit did he make ?

15. (**Hard**)

I bought a box of 10 pastries for my shop at a total cost of £2·20.

After selling all the pastries, I found I had made a profit of £1·30 altogether.

What must I have charged for each pastry ?

16. A newsagent bought a box of 200 pencils for £6·50.

He tied them into bundles of 10 and sold each bundle for 60p.

a How many bundles of 10 pencils did he make ?

b How much money did he make if he sold all the pencils ?

c How much profit did he make altogether ?

17. Mick bought 300 blank C.D.'s for £150.

He packed them in envelopes holding 20 discs each and sold each pack for £11·50.

a How many packs of 20 C.D.'s did he sell ?

b How much money did he make if he sold all the packs ?

c How much profit did he make altogether ?

Hire Purchase

Imagine you had just bought a flat and wanted to buy a washing machine, but you did not have the cash to purchase it.

You can do a deal with the shop, whereby you leave a small **deposit** (say £40) and agree to pay up the balance each month over a year.

This is called a "**Hire Purchase**" agreement.

Washitron - £310

Here is how to work out how much you pay for the washing machine using hire purchase (H.P.)

Deposit -	=	£40
+ 12 payments of £25	=	£300
Total Cost	=	**£340**

Do you notice that this has worked out **£30 dearer (£340 - £310) ?*

*This is the **down-side** of Hire Purchase - it usually **costs you more** !!*

Exercise 3

(*Show all your working and set each question down as shown above*).

1. I can buy this TELL - Computer for £750 cash.

I can buy it using a Hire Purchase agreement by making

- a deposit of £50
- plus 12 monthly payments of £65.

TELL

Cash Price £750

H.P. ... Deposit £50
+ 12 payments of £65

a Copy this working and complete it :-

Deposit -	£50
+ 12 payments x £65 =	£.....
Total H.P. price =	**£**.....

b How much did it cost altogether using Hire Purchase ?

c How much would I have saved by paying cash ?

2. I bought a second hand car from "Crafty Chris" using Hire Purchase.

I left him a deposit of £250 and agreed to make **18** monthly payments of £105 each.

a Copy the working and complete it.

Deposit -	£....
+ 18 payments x £105 =	£.....
Total H.P. price =	**£**.....

Crafty Chris' Autos

Cash Price - £1800

b How much **extra** did I pay for the car ?

3. I bought a new sofa from "Duncans Furnishers".

I paid a deposit of £75 and followed this with 9 monthly payments of £110·50.

a Calculate how much I paid in total using the Hire Purchase method.
(*Show your three lines of working*).

b How much cheaper would it have been if I had paid cash ?

Duncans Furnishers

Sofa – Cash Price £950

4. **Larry's Carpets**

Special Price – £465

The carpet for my living room cost me £465.

I couldn't afford to pay cash so I took out a Hire Purchase agreement.

The deposit was only £40 and the 15 monthly payments were £32·20 each.

a How much did it cost me for the carpet on H.P. ?

b How much more was this than the cash price ?

5. When Sally and Nick had their first baby they bought a new pram from "Grannycare", priced £195.

They bought it on Hire Purchase by making a deposit of £20, followed by 26 weekly payments of £7·50.

a How much did they pay for the pram using H.P. ?

b How much more was this than the cash price ?

£195

6. **£17750**

TOPYIELD

Farmer Jones bought a TOPYIELD tractor from "Farming Supplies".

He took out a Hire Purchase agreement.

The deposit was £1500, followed by 48 monthly payments of £362·50.

a How much did it cost altogether for the tractor using H.P. ?

b How much more was this than the cash price ?

7. I bought a Reflector Telescope from Frank's for £365.

He allowed me to leave a deposit of £50 and make 6 monthly payments of £52·50 each.

a Calculate the total cost of the telescope using Hire Purchase.

b Did it cost me any more using this method than if I had paid cash ?

c Why do you think some shops don't charge more when you take out a short term hire purchase agreement ?

8. Sometimes a hire purchase agreement doesn't cost you any more money.

David wanted to buy a new motorbike which was priced at £3500.

The salesman allowed him to make a deposit of £800 and pay the balance over 6 months **at no extra cost**.

a After making the £800 deposit, how much did David still owe ?

b If he paid this evenly over the 6 months, how much did he pay each month ?

9.

Weddings Are Us

Lucy bought her £650 wedding dress from "Weddings Are Us".

She agreed to pay a deposit of £80 and pay the balance over 10 months at no extra charge.

a After paying the deposit, how much did she still have to pay for her dress ?

b How much did this leave her to pay each month ?

10. Bill and Brenda bought a TRENDIX tumble drier for £345 from "Eric's Electrics".

a How much of a deposit had they to pay ?

b What were their monthly repayments ?

ERIC'S ELECTRICS
No Deposit !!!
Pay back in 15 months at no extra cost !!!

11.

Malcolms for Music

"Fender" Electric Guitar
£650

10% deposit + 9 monthly payments £71·50

Judy bought a guitar from "Malcolms for Music" using their hire purchase agreement.

a Copy and set down the working as follows :-

Deposit :- 10% of £650	=	£....
+ 9 payments x £71·50	=	£....
Total H.P. price	=	**£**....

b How much would Judy have saved if she had paid cash ?

12. Martin bought a STAEDLER Motorboat to cruise around the Mediterranean.

He paid a deposit of 20% of the cash price and 30 monthly payments of £1450.

a Calculate how much this H.P. agreement cost Martin altogether.

b How much more expensive was this than paying cash ?

Boat Services
£45 000

STAEDLER

Insurance - Household

Discussion Points :-

"Why would you want to insure your house ?"

"Why insure the contents - What can happen to them ?"

*"Why is **content rate** higher than **building rate** ?"*

"How can insurance companies offer to pay out £1000's for claims ?"

Hutton & Steel Insurance Company

Annual Premium Rates

Building - £3·35 per £1000
Content - £6·20 per £1000

Brown, Brown & Black Insurance Company

Yearly Premiums

Building - £3·50 per £1000
Content - £5·90 per £1000

Example :- Mick and Elsie's flat was bought for £88 000.

How much would it cost to insure it with Hutton & Steel ?

Set down all answers like this =>

To insure the house for £1000, the cost is £3·35.

=> To insure it for £88 000, the cost is 88 × £3·35.

= **£294·80**.

Exercise 4

Use the 2 sets of insurance rates shown above. Set down using the 2 lines in the example.

1. Bill and Patty's bungalow is worth £174 000.

a How much would it cost each year to insure it with Hutton & Steel ?

b How much would it cost each year to insure it with Brown, Brown & Black ?

2. John and Janice's detached villa is valued at £197 000.

How much would it cost each year to insure it with Brown, Brown & Black ?

3. James and Pauline recently bought a new flat in George Square in Glasgow.

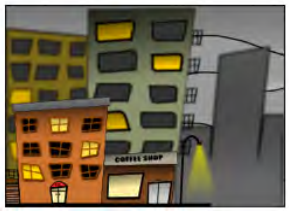
They paid £380 000 for it.

How much would the premium be each year to insure it with Hutton & Steel ?

4. Brian sold his villa, valued at £210 000 and moved to a small flat in Edinburgh for which he paid £105 000.

His villa had been insured with Hutton & Steel.

He insured his new flat with Brown, Brown & Black.



a What was the yearly insurance on his old villa ?

b What is the yearly insurance on his new flat ?

c How much money did he save each year on insurance when he moved house ?

5. Ralph and Sheena met with an insurance agent from Hutton & Steel.

He looked round their house and valued the CONTENTS at £44 000.

How much would Ralph have to pay to insure the **contents** for 1 year with Hutton & Steel ?

6. Each of the following couples insured the **contents** of their houses with Brown, Brown & Black for a year because their rates were lower (see table).

Calculate the **annual premium** (payment due each year) for each :-

a Ann and Alan.
Contents worth – £32 000

b Donnie and Jean.
Contents worth – £18 000

c Tania and John.
Contents worth – £36 000

d Sandy and Janet.
Contents worth – £11 000

e Ian and Sandra.
Contents worth – £15 000

f Dick and Tracey.
Contents worth – £9 500.

7. Eric and Carol's flat is valued at £106 000.

The entire contents of their flat are valued at £45 000.

They insure everything with Hutton & Steel.

a How much will their annual **building** insurance be ?

b How much will their annual **contents** insurance be ?

c How much will their annual **total** insurance be ?

d If they pay their insurance monthly, what will their payments be each month ?

8. Fred and Betty's bungalow is valued at £195 000.

The entire contents of their bungalow are valued at £47 000.

They insure everything with Brown, Brown & Black.

a What will their annual **building** insurance be ?

b What will their annual **contents** insurance be ?

c What will their annual **total** insurance be ?

d If they pay their insurance monthly, what will their payments be each month ?

9. Barney and Wilma's detached villa was valued at £152 000 in 2008.

By 2012, it had risen in value to £175 000.

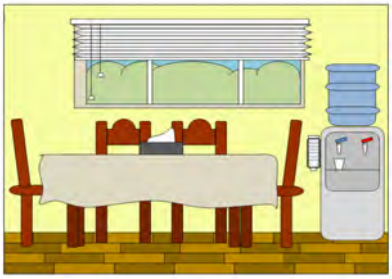
a How much would their yearly insurance have been in 2008 with Brown, Brown & Black ?

b How much would it have been in 2012, still with Brown, Brown & Black, assuming their rates had not risen ?

c How much of a rise in their premium was this ?

10. My semi-detached villa is valued at £164 000.

I estimate the furniture and contents to be worth £38 000.



a If I insure the **building** and the **contents** with Hutton & Steel, what will it cost me in insurance for the year ?

b If I choose to insure both **building** and the **contents** with Brown, Brown & Black, what will the total cost be ?

c Which of the two is dearer and by how much ?

d **Harder** :- Look at the answers to **b** and **c**.

I can save money on insurance by insuring the building with one company and the contents with the other.

Calculate the **cheapest total** I could pay for my insurance.

Insurance - Life

MONTHLY PREMIUMS FOR EVERY £1000 INSURED

BROWNLIE & HOBBS
Whole Life (with profits)

Age		Non Smoker	Smoker
Male	Female		
16-24	16-31	£3·10	£4·30
25	32	£3·90	£4·35
26	33	£3·95	£4·45
27	34	£3·95	£4·55
28	35	£4·00	£4·70
29	37	£4·05	£4·80
30	38	£4·10	£4·90
31	39	£4·20	£5·00

Exercise 5

1. **a** How much would it cost per month for Brian, aged 28 and a non-smoker, to insure his life for £1000 with Brownlie & Hobbs (see table) ?

b Brian insures his life for £50 000.

Calculate his monthly premium.

Set down like this :-

for £1000 of insurance, premium is £4·00

for £50 000, it is **50** × £4·00 = **£**.....

2. Natalie is 25 years of age.

She wants to take out insurance for £30 000.

Calculate her monthly premium if she is a **non-smoker**.

3. Bobby is 31 years of age and insures his life for £40 000.

If he is a smoker, calculate his monthly premium.

4. Calculate the monthly premium due for **Whole Life Policies** taken out by the following people :-

a Ted, a smoker, is aged 26. He insures his life for £60 000.

b Mariah, a smoker, is aged 24. She insures her life for £100 000.

c Nicola, a non-smoker, is aged 19. She insures her life for £25 000.

d Steven, a non-smoker, is aged 29. He insures his life for £45 000.

e Alister, a smoker, is aged 22. He insures his life for £80 000.

f Rachel, a non-smoker, is aged 38. She insures her life for £60 000.

BROWNLIE & HOBBS

Endowment (with profits)

Age		10 Years		20 Years	
Male	Female	Non Smoker	Smoker	Non Smoker	Smoker
16-24	16-31	£8·65	£10·29	£3·58	£5·13
25	32	£8·66	£10·30	£3·60	£5·14
26	33	£8·67	£10·31	£3·61	£5·15
27	34	£8·68	£10·32	£3·62	£5·16
28	35	£8·68	£10·33	£3·64	£5·17
29	37	£8·69	£10·34	£3·65	£5·18
30	38	£8·70	£10·34	£3·66	£5·19
31	39	£8·71	£10·35	£3·67	£5·21

MONTHLY PREMIUMS FOR EVERY £1000 INSURED

5. Barry is aged 30 and a non-smoker.

He wished to take out an **Endowment Policy** over 10 years with Brownlie & Hobbs.

a What is Barry's monthly premium for a policy of £1000 (see above table) ?

b Now calculate his premium each month for a policy of £30 000.

6. Elaine is aged 33 and a heavy smoker.

She wants to take out an Endowment policy over a period of 20 years.

a What is her monthly premium per £1000 ?

b How much would it cost her each month for a policy of £50 000 ?

7.

Rob is only 21 and hates smoking.

He takes out an Endowment policy over a period of 20 years.

a What is Rob's monthly premium per £1000 ?

b He takes out a policy for £80 000.

Calculate his monthly premium.

8. Calculate the monthly premium due for **Endowment Policies** taken out by the following :-

a Karen, a non-smoker, is aged 32, and takes out a 10 year policy for £25 000.

b Norman, a non-smoker, is aged 20, and takes out a 20 year policy for £40 000.

c Lynsey, a non-smoker, is aged 37, and takes out a 10 year policy for £15 000.

d Ryan, a smoker, is aged 31, and takes out a 10 year policy for £60 000.

e Britney, a smoker, is aged 25, and takes out a 20 year policy for £45 000.

f Will, a non-smoker, is aged 26, and takes out a 20 year policy for £100 000.

Foreign Exchange

Euros (€) are widely used throughout Europe.

Example 1 :- To change £80 into Euros you simply **MULTIPLY** :-

£80 = 80 x 1·25€ = **100€**

Best Exchange Rates in Town

£1 = 1·25€ (All Europe)

£1 = $1·60 (America)

£1 = 1·50 (Australian Dollars)

Example 2 :- To change £120 into American Dollars, again, you simply **MULTIPLY** :-

£120 = 120 x $1·60 = **$192·00**

Exercise 6

1. Stef went to San Antonio in Ibiza.

He changed £400 to euros before leaving.

How many euros did he receive ?

2.

Nick went to Paris at Easter and changed £250 to euros.

How many euros did Nick get ?

3. The MacDonalds flew to San Francisco (in America) and changed £800 into dollars.

How many dollars did they get ?

4.

Sheila and Billy went to Australia for a 3 week holiday.

They changed £1200 to Australian dollars.

How many dollars did they receive ?

5. Change the following :-

a £600 to euros

b £90 to euros

c £540 to American dollars

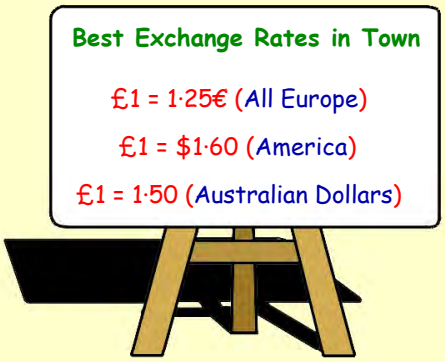
d £450 to Australian dollars

e £65 to euros

f £320 to American dollars.

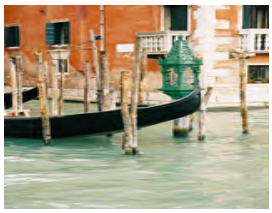
Example 3 :- To change $800 back into pounds you have to **DIVIDE** :-

$800 = 800 ÷ 1·60 = **£500**



6. June returned from Pisa in Italy with 91·50 euros.

How much would she get by changing them back to £'s ?

7. 

Kylie also went to Italy, but stayed in Venice.

She brought 650€ back and changed them back to £'s.

How much did she receive ?

8. Neil returned from America with $176·80.

How many £'s will he get when he exchanges his dollars ?

9. 

I brought 855 Australian dollars back from holiday.

How many £'s will I receive for them ?

10. How much would be given when the following amounts were exchanged for £'s :-

a 380 euros

b 60·80 euros

c $1278

d $3·60

e 204 Australian dollars

f 3880 euros ?

11. 

I changed £400 to euros before travelling to Italy.

a How many euros did I receive ?

b I spent 450€ when I was in Italy.

How many £'s did I have when I returned home ?

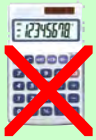
12. In this country, an iMAC computer costs £1100.

In Spain, the same computer costs 1300€ .

a If I bought the iMAC in Spain, how much would the equivalent cost be in £'s ?

b How much would I have saved in £'s if I had bought the computer in Spain ?

What Have I Learned ?



1. Write down the answers to the following (no calculator) :-

a 50% of £18 **b** 25% of £240 **c** 10% of £270

d $33\frac{1}{3}$% of £180 **e** 75% of 80p **f** 40% of £60.

You may use a calculator for the remainder of this exercise.

2. My salary in 2012 was £21 000. I received a rise of 4% in 2013.

How much did I earn in 2013 ?

3. A Honda dealer buys Honda Civic 1.4s for £13 800.
He sells them for £16 955.

How much profit does he make on each car ?

4. SAVECO buys in boxes of 48 tins of Nice beans for £12·52 per box.
Each tin sells for 34 pence.

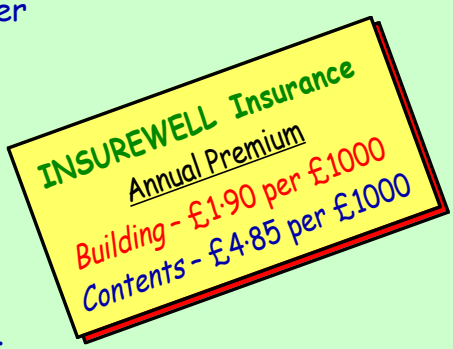
How much profit is made when a whole box of 48 tins is sold ?

5. I bought this KUZIWASHY scooter using a Hire Purchase agreement.
I left a deposit of £250 and agreed to make 18 monthly payments of £272·50.

£4900

a How much did it cost me altogether for the scooter using the H.P. terms ?

b How much could I have saved by paying cash ?



6. **a** My detached villa is valued at £185 000.
How much would it cost me to insure it each year with INSUREWELL ?

b The value of the contents of my house is £30 000.
How much would it cost to insure the contents with INSUREWELL for a year ?

7. Look at the Whole Life Insurance table on **page 191**.
Lucy is 34 and a heavy smoker.
She wishes to take out a Whole Life Insurance policy for £15 000.

Calculate her monthly premium (how much she pays each month).

8. Look at the exchange rates on **page 194**.

a If I change £720 to euros, how many will I receive ?

b If I change $496 back to £'s, how many will I receive ?

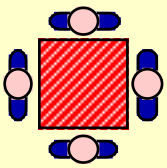
CHAPTER 16

Linear Patterns

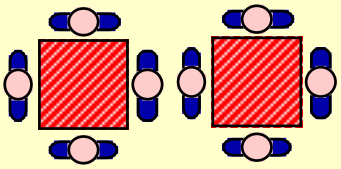
Simple Linear Patterns

It is sometimes easy to spot a **NUMBER PATTERN** from a diagram or from a table.

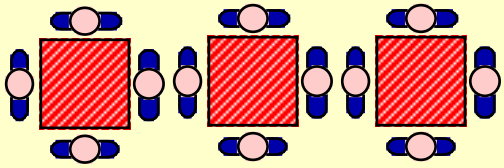
Example :- In a restaurant, 4 people can sit around each table.



1 table
4 customers



2 tables
8 customers



3 tables
12 customers

Drawing up a table helps us to see a pattern :-

No. of tables (T)	1	2	3	4	5	6
No. of customers(C)	4	8	12	16	?	?
		4	4	4		

Can you see that for every *new* table the number of customers **rises by 4** ?

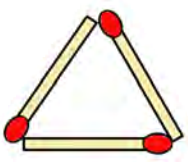
=> we can write, in words :-

no. of customers = 4 x no. of tables

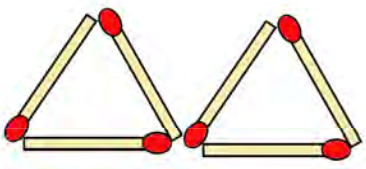
=> or in symbol form :- $C = 4 \times T$

Exercise 1

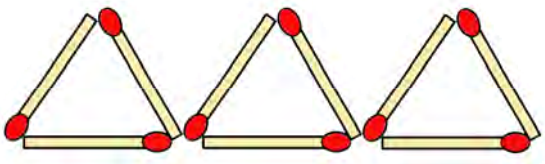
1. A pattern is made using matchsticks as seen below :-



1 triangle
3 matchsticks



2 triangles
6 matchsticks



3 triangles
9 matchsticks

a Draw the next pattern of matchsticks using 4 triangles.

1. **b** Copy the following table and complete it :-

No. of triangles (T)	1	2	3	4	5	6
No. of matches (M)	3	6	?	?	?	?
			?	?	?	

c For every extra triangle, how many extra matches are needed ?

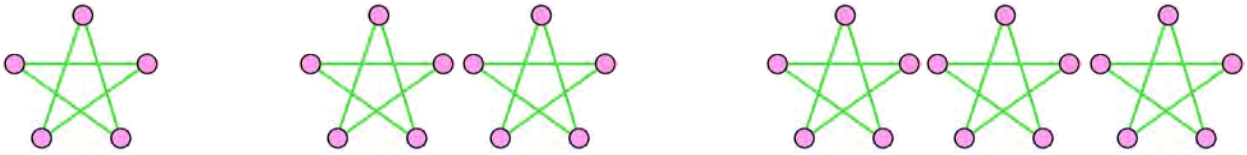
d Write down the formula for calculating the number of matches needed assuming you know the number of triangles :-

Copy this :- **number of matches = ? × number of triangles**

e Now write down the formula in **symbols** i.e. ***M*** = ? × ***T***.

f Use your formula to decide how many matches are needed to make 40 triangles.

2. Look at the pattern of "pentagrams" and circles :-



1 pentagram
5 circles

2 pentagrams
? circles

3 pentagrams
? circles

a Draw the next pattern of pentagrams and circles.

b Copy the following table and complete it :-

No. of pentagrams (P)	1	2	3	4	5	6
No. of circles (C)	5	?	?	?	?	?
		?	?	?		

c For every extra pentagram, how many extra circles are needed ?

d Write down the formula for calculating the number of circles needed assuming you know the number of pentagrams :-

Copy this :- **number of circles = ? × number of pentagrams**

e Now write down the formula in **symbols** i.e. ***C*** = ? × ? .

f Use your formula to decide how many circles are needed if you have 20 pentagrams.

3.

6 windows

a Copy and complete this table, listing the number of **windows** in these houses.

No. of houses (H)	1	2	3	4	5	6
No. of windows (W)	6	?	?	?	?	?
		?	?	?		

b Copy and complete :- "**the number of windows** = ... x **the number of houses**".

c Write the formula using symbols connecting W and H.

d Use this "**rule**" to say how many windows there would be in **10 houses**.

4. Look at the cost of buying footballs for a Junior football club :-

1 ball cost = £8

2 balls cost = £16

3 balls cost = £....

4 balls cost = £....

a Copy and complete this table, listing the costs of buying footballs.

No. of footballs (F)	1	2	3	4	5	6
Total Cost £(C)	8	?	?	?	?	?
		?	?	?		

b Copy and complete :- " Total Cost = ? x the number of footballs".

c Write the formula using symbols connecting C and F.

d Use this formula to find the cost of 15 footballs.

5. Copy and complete this table which shows the number of minutes it takes a woman and her dog to walk various distances :-

No. of kilometres (K)	1	2	3	4	5
Time taken in minutes (M)	12	24	?	?	?
			?	?	?

a How many extra minutes does it take for each extra kilometre ?

b Write a formula connecting the time and the no. of kilometres => M = ? x ?.

c Use your formula to decide how long it would take to travel 30 kilometres.

6. A primary classroom has several copies of a child's picture book.

The table indicates the total number of pages for various books :-

No. of books (B)	3	4	5	6	7	8
No. of pages (P)	18	24	30	36	?	?
		?	?	?		

a Given that 3 books have 18 pages, how many pages are there in 1 book ?

b Write a formula connecting the number of pages and the number of books :-

=> P = ... × ... .

c Use your formula to decide how many pages there are in 20 books.

7. For each of these tables, determine a formula or rule connecting the two letters :-

a

No. of trees (T)	1	2	3	4	5	6
No. of apples (A)	40	80	120	160	?	?
		?	?	?		

$A = ? \times T$

b

Lengths swam (L)	1	2	3	4	5	6
Time in mins (T)	7	14	21	28	?	?
		?	?	?		

$T = ? \times L$

c

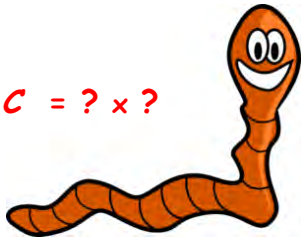
No. of cakes made (C)	1	2	3	4	5	6
Grams of flour (G)	120	240	360	?	?	?
		?	?	?		

$G = ? \times ?$

d

No. of inches (I)	1	2	3	4	5	6
No. of centimetres (C)	2·5	5·0	7·5	?	?	?
		?	?	?		

$C = ? \times ?$



e

No. of bottles (B)	2	3	4	5	6
No. of millilitres (M)	660	990	1320	?	?

$M = ? \times ?$

Not $M = 660 \times B$.

f

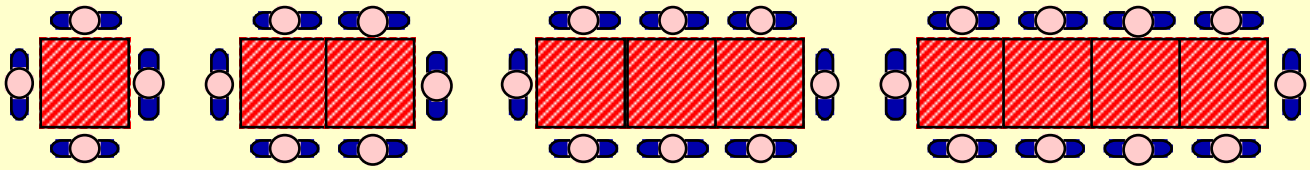
No. of orbits (N)	3	4	5	6	7
Time in hours (H)	15	20	25	?	?

$H = ? \times ?$

Trickier Linear Patterns

In all the patterns we have met so far, the numbers on the bottom line of the table were part of the 2 x, 3 x, 4 x, etc. tables and were easily recognisable.

Look at this different type of pattern, again to do with restaurant tables :-



1 table
4 customers

2 tables
6 customers

3 tables
8 customers

4 tables
10 customers

Drawing up a table helps us to see a patterns :-

No. of tables (T)	1	2	**3**	4	5	6
No. of customers (C)	4	6	**8**	10	12	14
		2	2	2		

Can you see that for every new table the number of customers **rises by 2** ?

Step 1 => We can **begin** to write, in symbols :-

$C = 2 \times T$ - but this **doesn't work** !

Step 2 => We need a **CORRECTION NUMBER** to make the pattern work.

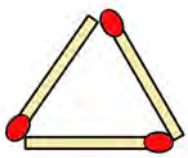
Look at the (T =) **3** and (C =) **8** values - can you see that $2 \times 3 \neq 8$.

But $2 \times 3 + 2$ gives 8 (*check that $2 \times 4 + 2 = 10$, $2 \times 5 + 2 = 12$....*).

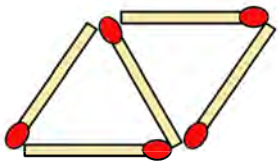
So our real formula is :- $C = 2 \times T + 2$

Exercise 2

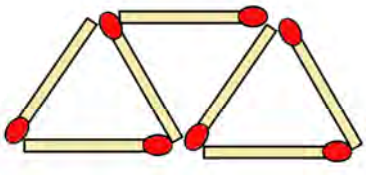
1. A pattern is made using matchsticks as seen below :-



1 triangle
3 matchsticks



2 triangle
5 matchsticks



3 triangle
7 matchsticks

1. **a** Draw neatly the next set of matchsticks patterns with **4 triangles**.

b Copy the following table and complete it :-

No. of triangles (T)	1	2	3	4	5	6
No. of matches (M)	3	5	?	?	?	?
		2	?	?		

c For every extra triangle, how many extra matches are needed ?

d Write down the formula using **symbols** for calculating the number of matches needed if you know the number of triangles :-

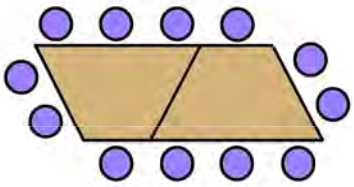
Copy :- M = ... x T + ...

remember the correction number

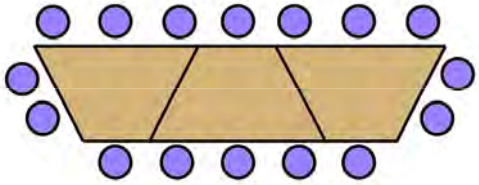
e Use your formula to decide how many matches are needed to make 10 triangles.

2. Look at the pattern of TRAPEZIUM shaped tables and customers in a restaurant.

1 table
8 customers



2 tables
12 customers



3 tables
16 customers

a Draw the next pattern showing 4 tables with customers around them.

b Copy the following table and complete it :-

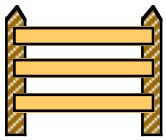
No. of tables (T)	1	2	3	4	5	6
No. of customers (C)	8	12	16	?	?	?
		?	?	?		

c For every extra table, how many extra customers can be seated ?

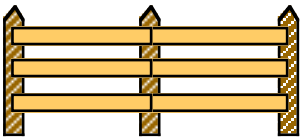
d Write down the formula using **symbols** i.e. C = ... x T + ...

e Use your formula to decide how many customers can sit around 12 tables placed in a straight row as in the pattern above.

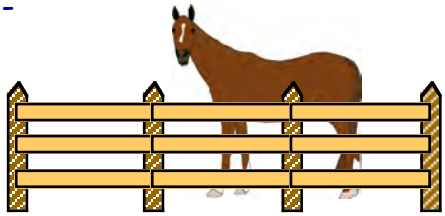
3. Look at the pattern of "fence posts" and "fence boards" :-



2 posts
3 boards



3 posts
6 boards



4 posts
9 boards

a Draw the next pattern of fence posts and boards.

b Copy the following table and complete it :-

No. of posts (P)	2	3	4	5	6	7
No. of boards (B)	3	6	9	?	?	?
		3	?	?		

This time the correction number has to be subtracted

c For every extra post, how many extra boards are needed ?

d Write down the formula using **symbols** :- B = ... × P − ..... .

e Use your formula to decide how many boards are needed with 15 posts.

4. This table shows the cost of hiring a cement mixer for several days :-

No. of days hired (D)	1	2	3	4	5	6
Cost in £'s (C)	8	13	18	23	28	?
		?	?	?		

a How much will it cost to hire the mixer for **(i)** 6 days **(ii)** 7 days ?

b How much **extra** does it cost for each additional day of hire ?

c Write down the formula for determining the cost of hiring the mixer :-

C = ... × D + ...

d How much will it cost to hire the mixer for 10 days ?

5. The weight of a pickup truck carrying identical turbos is given below :-

No. of turbos (T)	1	2	3	4	5
Total weight in tonnes (W)	1·4	1·7	2·0	2·3	2·6
		?	?	?	

a How much does each extra turbo weigh ?

b Find a formula for the total weight W = ... × T + ...

6. Shown below are some tables of values connecting pairs of letters.

Use the method shown to determine a formula or rule connecting the second letter in the table to the first letter.

a

Number (N)	1	2	3	4
Cost (C)	6	9	12	15

$C = ? \times N + ?$

b

Length (B)	1	2	3	4
Area (A)	13	18	23	28

$A = ? \times B + ?$

c

Number (N)	1	2	3	4
Weight (W)	50	54	58	62

$W = ? \times N + ?$

d

Temp. (T)	1	2	3	4
Volume (V)	19	26	33	40

$V = ? \times T + ?$

e

Distance (D)	1	2	3	4
Time (T)	8·5	10·5	12·5	14·5

$T = ? \times D + ?$

f

Time (T)	1	2	3	4
Depth (D)	2	8	14	20

$D = ? \times T - ?$

g

Paces (P)	1	2	3	4
Distance (D)	5	16	27	38

$D =$ .....

h

Diameter (D)	1	2	3	4
Perimeter (P)	93	108	123	138

$P =$ .....

7. Rainwater begins to pour into a barrel from the roof of a hut.

The depth of water is given in the table below.

Time in mins (T)	1	2	3	4	5
Depth in cm (D)	32	35	38	41	44

a By how many centimetres is the depth of water increasing every minute ?

b Find a formula for the depth (D) in terms of the time (T) :-

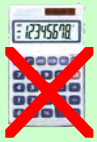
=> $D =$ ..... $\times T +$ ..... .

c Calculate the depth after 10 minutes.

d **(Difficult)*** The barrel is 74 centimetres in height.

If the water continues to pour into the barrel at the same rate, after how many minutes will it be full and begin to overflow ?

What Have I Learned ?



1. Look at these Gingerbread Men :-

1 gingerbread man
7 red smarties

2 gingerbread men
... red smarties

3 gingerbread men
... red smarties

a How many **extra** smarties (*S*) are needed for each gingerbread man (*G*) ?

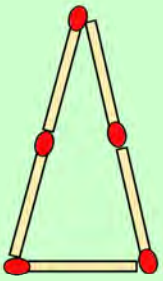
b Write a formula connecting *S* and *G*. => *S* = ? × *G*.

2. This table tells how many corners there are in various octagons :-

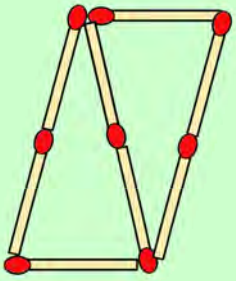
No. of octagons (*N*)	1	2	3	4	5	6
No. of corners (*C*)	8	16	24	?	?	?

From the table, construct a formula connecting the number of corners to the number of octagons :- *C* = ... × *N*.

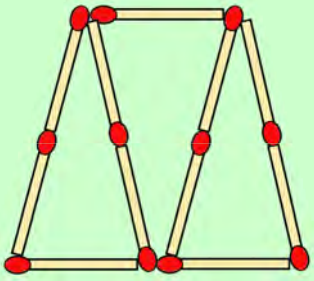
3. Shown is a pattern of triangles made with matches :-



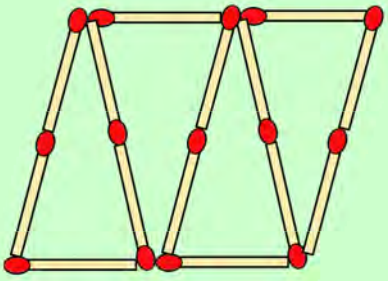
1 triangle
5 matches



2 triangles
8 matches



3 triangles
11 matches



4 triangles
.... matches

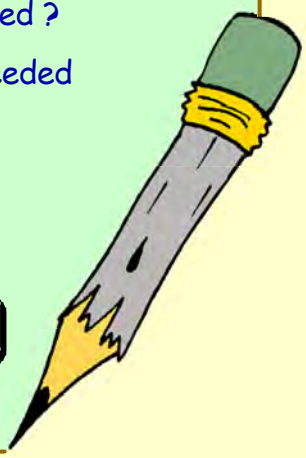
a How many **extra** matches are needed for every new triangle added ?

b Make up a formula for calculating the number of matches (*M*) needed to make (*T*) triangles.

4. Make up a formula showing the connection between *C* and *N* here :-

Number (*N*)	1	2	3	4
Cost (*C*)	7	11	15	19

C = ... × *N* + ...



CHAPTER 17

Probability - what does it mean ?

The **PROBABILITY** of something happening simply means the **FRACTION** of times it would happen "**in the long run**".

Probability is a fraction and can only take values from 0 to 1.

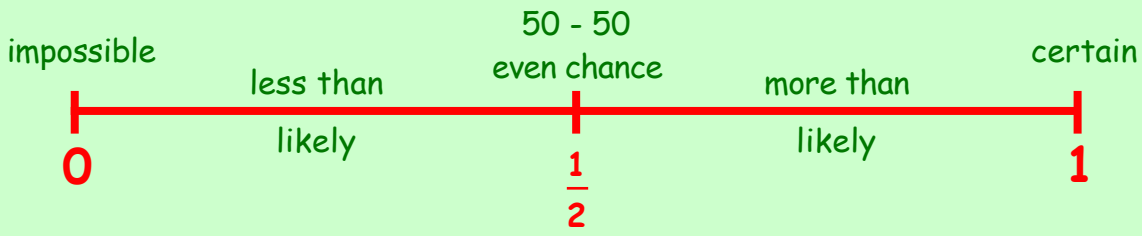
Example :-

the probability of meeting someone who is over 3 metres tall is **0**

the probability a tossed coin will end up showing a head is $\frac{1}{2}$

the probability the day after Monday will be Tuesday is **1**.

A **probability line** is any line numbered from 0 to 1 representing all probabilities.



Introductory Exercise

(*To be done orally*).

For each of these statements, say whether the probability of it happening is :-

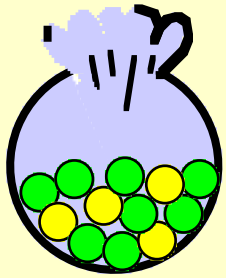
impossible - less than likely - evens - more than likely - certain.

1. Choose a card from a pack and it's red.
2. Go on a diet and lose 2 stones overnight because of it.
3. Go on a diet and lose at least 1 pound overnight because of it.
4. It will be a sunny day **every** day in January.
5. If I jump into the swimming pool, I will get wet.
6. If I toss a coin, it will end up showing a tail.
7. If I choose a day at random, it will be one from the week-end.
8. The next person I bump into will be a female.
9. If today is Friday, tomorrow will turn out to be Sunday.
10. A new born baby boy will weigh less than 1 stone (6·4 kilograms).
11. If I choose a bead at random from a bag containing only blue beads, the bead will be blue.
12. If I choose a bead at random from a bag containing only blue beads, the bead will be red.

Probability - Some Calculations

The **PROBABILITY** of something happening can be thought of as a simple fraction.

$$\text{Probability of event happening} = \frac{\text{number of favourable ways}}{\text{number of possible ways}}$$



Example :- This bag contains 4 yellow beads and 8 green beads.

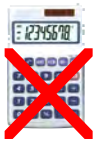
If a bead is chosen at random, what is the probability I will have chosen a yellow bead ?

Solution :- Look at this simple notation :-

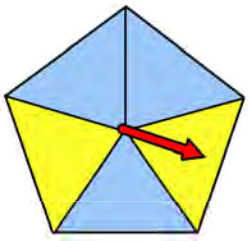
$$P(\text{yellow})^* = \frac{4 \text{ (yellow beads)}}{12 \text{ (beads altogether)}} = \frac{4 \div 4}{12 \div 4} = \frac{1}{3}.$$

note :-* **P(yellow) is shorthand for "the probability of choosing a yellow bead".

Exercise 1



1. This pentagonal spinner is spun and the colour noted.



Calculate, as a fraction, the probability it will point to :-

a a yellow segment. P(yellow).

b a blue segment. P(blue).

2. A normal dice is rolled and the number on top is noted.

a How many numbers are there on a standard dice ?

b What is the probability it will show a five ? P(5) = ...

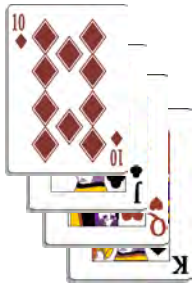
c What is the probability it will show a one ? P(1) = ...

d What is the probability it will show an even number ? P(even) = ...

e What is the probability it will show a number bigger than 2 ? P(> 2) = ...

f What is the probability it will show a seven ? P(7) = ...

3. A pack of cards is shuffled and the top card turned over.



a How many cards are there in a standard pack ? (*No jokers*).

b What is the probability the card is red ? P(Red).

c What is the probability the card is an Ace ? P(Ace).

d What is the probability the card is a face card ? P(Face).

e What is the probability the card is a number from 2 to 10 ? P(2 to 10).

f What is the probability the card is the Queen of Hearts ? P(Q❤).

4. Six men and nine women write their names on pieces of paper, fold them up and put them in a hat.

If a name is pulled at random from the hat, what is the probability :-

a it will be a man's name **b** it will be a woman's name ?

5. A gardener has 4 white, 6 yellow and 10 red pansy seeds, but they are mixed up and he can't tell which is which.

If he picks one at random and plants it in a pot, what is the probability he has chosen a pansy which is :-

a white **b** red **c** not white

d yellow **or** white **e** red, white **or** yellow **f** purple ?

6. At the fairground, one of the stalls contains the 4 by 4 grid shown opposite. People pay 20p and throw a counter onto the grid to try to win a prize.

lose	20 p	lose	£1
lose	10 p	lose	£1
£1	lose	30 p	lose
lose	50 p	lose	£1

Assuming your counter actually lands **on a square** on the board, what is the probability :-

a you lose **b** you win a prize

c you win a 50p **d** you win £1

e you end up with less than your initial stake ?

7. A driver notes the times a set of traffic lights is at red, green, etc., and in a full "cycle" the times are as follows :-

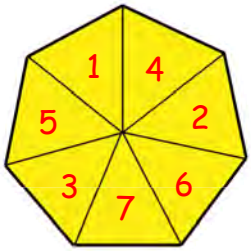
red - 20 seconds	**red/amber** - 5 seconds
green - 25 seconds	**amber** - 10 seconds

A motorist drives up to the set of lights. What is the probability the lights will show :-

a red **b** green **c** amber or red/amber ?

(*Try to simplify your fractions as far as possible*).

8. This 7-sided spinner is spun and the number it lands at is noted.



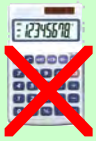
What is the probability it stops at :-

a the number 6 **b** an even number

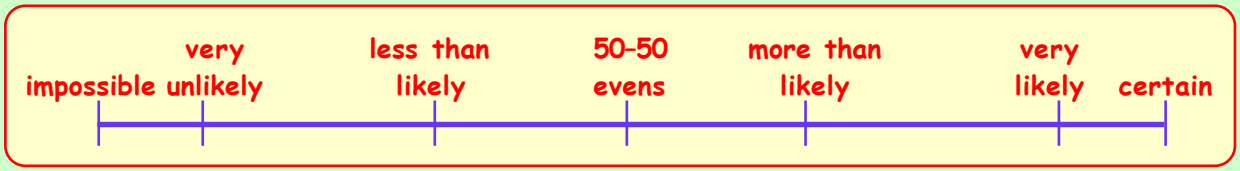
c a number less than 5 **d** a multiple of 3 ?

9. The probability of something happening is $\frac{3}{8}$. What is the probability it will **not** happen ?

What Have I Learned ?



1. Neatly **draw** this "**Probability Line**".



For each of the following, put the capital letter below the line in the correct place to represent the probability.

A - The next person I meet will be male.

B - It is mid-January. It will rain at least once in the next week.

C - The sun will NOT rise tomorrow.

D - The rabbit that I am holding is a male or a female.

E - In a class of 18 boys and 11 girls a name is chosen at random and it will be that of a girl.

F - If I choose a card from a pack it will be the ace of spades.

G - The month showing on my calendar will have a "**y**" in it.

2. Look at this simplified dartboard. If I throw a dart at it and it **does land** on a number, what is the probability it will :-

a be a 5 **b** be an even number

c **not** be a 7 **d** be a number smaller than 4

e be a 16 **f** be any number from 1 – 12 ?

3. In a race around a circular track,

4 of the cars are green	6 of the cars are blue
12 of the cars are red	2 of the cars are yellow.

If I am standing at the edge of the track. What is the probability the next car to pass me will :-

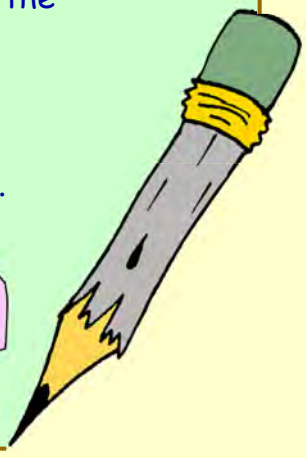
a be blue **b** be yellow **c** **not** be red ?

4. There are 20 coloured cubes in a bag – only pink ones and blue ones.

The probability of picking a blue cube is $\frac{7}{10}$.

a What is the probability of picking a **pink** cube ?

b How many blue cubes and how many pink ones are there ?



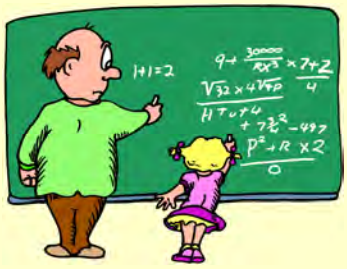
CHAPTER 18

Whole Numbers 2

Rounding using Significant Figures

In previous work, we rounded to 1, 2 or 3 decimal places.

In mathematics, a figure or digit in a number is "**significant**" if it gives some sense of **Quantity & Accuracy**.



Zeros can be complicated - When do we count them ?
When do we ignore them ?

If zeros are used only to show where the position of the decimal point is, then they are **NOT significant**.

Example 1 :-

409 has **3** significant figures
80·7 has **3** significant figures
1·02 has **3** significant figures
0·604 has **3** significant figures
0·07020 has **4** significant figures

(The **front** zero positions the decimal point, but **trailing** zeros shows accuracy).

Example 2 :-

8361 rounded to **1 significant figure**	=>	**8000**
13 342 rounded to **3 significant figures**	=>	**13 300**
4·5568 rounded to **3 significant figures**	=>	**4·56**
0·007 7912 rounded to **2 significant figures**	=>	**0·0078**

Exercise 1

1. How many significant figures does each number have in the following context :-

a There are **400** pennies in £4

b The official attendance at a local match was **7000**

c The cost of a glossy magazine is £**7·80**

d The weight of a bag of potatoes was **1·4** kilograms

e The volume of a bottle of water is **500** millilitres ?

2. Write down how many **significant figures** there are in each of these numbers :-

a 45·0	**b** 5·00	**c** 3·001	**d** 746
e 20·7	**f** 302·1110	**g** 76·40	**h** 0·189
i 0·015	**j** 8·000 008	**k** 0·070 30	**l** 0·000 90
m 30·000 20	**n** 777·000	**o** 0·000 007	**p** 0·000 000 20.

3. Round each number to **1** significant figure :-

a	67	**b**	742	**c**	6118	**d**	56 297
e	4298	**f**	3467	**g**	7·54	**h**	0·045
i	0·456	**j**	0·0099	**k**	0·000 642	**l**	39·21.

4. Round each number to **2** significant figures :-

a	607	**b**	5124	**c**	30 701	**d**	653 761
e	46·68	**f**	36·54	**g**	9·276	**h**	0·123
i	0·587	**j**	0·006 647	**k**	0·044 55	**l**	99·512.

5. Round each number to **3** significant figures :-

a	7654	**b**	55 066	**c**	99 754	**d**	345 199
e	8·234	**f**	77·934	**g**	0·534 456	**h**	0·876 234
i	0·001 541	**j**	0·010 67	**k**	0·055 66	**l**	0·099 999.

6. Find the weight of a box of 48 plates if each plate weighs 78 grams.
(*Give your answer in grams to 2 significant figures*).

7. What is the total volume, in millilitres, of 41 cups of tea each containing 175 ml ? (*Give your answer in ml to 3 sig. figs*).

8. A drilling machine, costing £44 640, was sold at a 12% discount.

Calculate the new cost, correct to 2 sig. figs.

9. Gary's laundry bill last month came to £218·10 + VAT at 20%.

Calculate the VAT, correct to 4 sig. figs.

10. Calculate, correct to 3 sig. figs., the **total** price on :-

a	£215·50 + VAT (*use 20% VAT*)	**b**	£12 540 + VAT (*use 20% VAT*)	**c**	£2342 + VAT. (*use 5% VAT*)

11.

The total annual wage bill for the 19 employees at Ray's Restaurant came to £364 786.

Calculate the **average** wage of each employee, to 2 sig. figs.

12. A bottle of honey weighs 0·675 kg.

Round this weight to 1 sig. fig. and **estimate** the total weight of 100 bottles.

Estimating using Significant Figures

Significant Figures can be used to estimate an answer to any calculation.

Examples :-

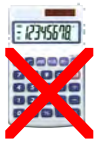
Round each number to **1 significant figure** and estimate :-

1. 7656 + 1436
=> 8000 + 1000
= **9000**

2. 572 x 221
=> 600 x 200
= **120 000**

3. 4487 ÷ 38.
=> 4000 ÷ 40
= **100.**

Exercise 2



1. By rounding each number to **1** significant figure, estimate :-

a	7453 + 2442	**b**	76 554 – 21 879	**c**	222 765 + 51 232
d	24 132 – 11 576	**e**	145 x 41	**f**	431 x 187
g	2154 x 432	**h**	609 x 888	**i**	732 ÷ 74
j	3456 ÷ 287	**k**	421 654 ÷ 1989	**l**	11 999 ÷ 542.

2. By rounding each number to **2** significant figure, estimate :-

a	6754 + 2065	**b**	44 751 – 14 682	**c**	2348 x 298
d	10 341 x 211	**e**	99 509 ÷ 195	**f**	1 271 444 ÷ 995.

3. By rounding each number to **1** significant figure, estimate :-

a	684 + 109 x 33	**b**	691 x 19 - 10 355	**c**	19 621 ÷ 42 + 393
d	3·74 + 8·4 x 2·3	**e**	73·4 – 10·95 x 6·199	**f**	323·3 ÷ 11·12 + 59·21.

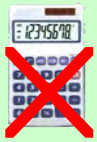
4. Round each number to **1** significant figure and estimate :-

a In a library, one hundred and ninety two fiction books are put onto a shelf.
How many fiction books are there on 53 shelves ?

b There are 19 646 pages in 47 identical copies of a book.
How many pages are in each book ?

5. Use a calculator to find the exact answers to questions 1-4.
Compare each answer to your estimate.

What Have I Learned ?



1. Round each of the following to **1 decimal place** :- **a** 22·74 **b** 0·876.

2. Round each of the following to **2 decimal places** :- **a** 2·5601 **b** 0·9956.

3. Round each of the following to **3 decimal places** :- **a** 0·4675 **b** 0·0904.

4. Round each of these to **1 significant figure** :- **a** 6154 **b** 44 600.

5. Round each of these to **2 significant figures** :- **a** 0·0534 **b** 2 345 006.

6. Round each of these to **3 significant figures** :- **a** 89 546 **b** 0·003 461.

7. How many significant figures have each of the following numbers been rounded to ?

a 0·6001 **b** 0·030 **c** 23 005.

8. For each of these :- **(i)** Round each number to **one significant figure**.

(ii) Give an **approximate** answer to each calculation.

a 514 x 58 **b** 1908 x 178 **c** 0·365 x 313

d 9761 ÷ 22 **e** 874 102 ÷ 3265 **f** 0·6565 ÷ 1·33.

9. The number of votes cast during the local Election in Strathluggie was **14 565**.

Round this to :- **a** **2 significant** figures **b** **1 significant** figure.

10. Rounded to **2 significant** figures, the number of bees in a hive was **5300**.

What was the **greatest** number of bees there could have been in the hive ?

11. 

On one load, a skip removes 654 150 kg of dirt from a building site.

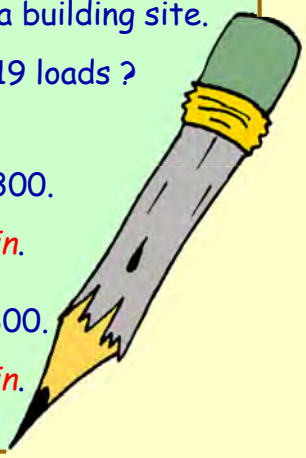
Approximately, what weight of dirt was removed on 19 loads ?

12. **a** To estimate the answer to 878 100 x 267, Tom uses 900 000 x 300.

Will Tom's estimate be on the high side or the low side ? *Explain*.

b To estimate the answer to 878 100 ÷ 267, Tom uses 900 000 ÷ 300.

Will Tom's estimate be on the high side or the low side ? *Explain*.

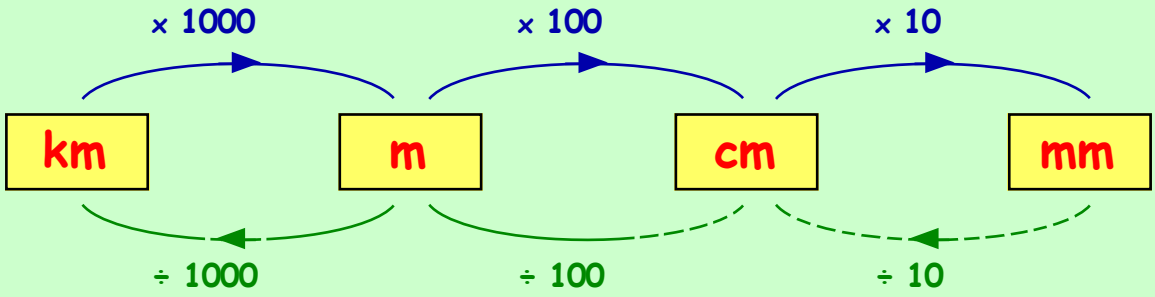


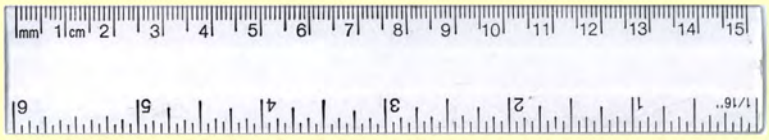
CHAPTER 19

Decimals 2

Converting Lengths (mm cm m km)

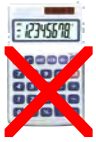
Rules For Changing





Examples :- "To change **kilometres** into **metres** – (x by 1000)"

or "To change **millimetres** into **centimetres** – (÷ by 10)"



Exercise 1

1. **5 cm = (5 x 10) mm = 50 mm.**

Change from centimetres to millimetres :-

a 6 cm b 15 cm c 3·5 cm d 0·2 cm.

2. **500 mm = (500 ÷ 10) cm = 50 cm.**

Change from millimetres to centimetres :-

a 200 mm b 40 mm c 75 mm d 3 mm.

3. **3 m = (3 x 100) cm = 300 cm.**

Change from metres to centimetres :-

a 6 m b 8·5 m c 0·4 m d 0·75 m.

4. **300 cm = (300 ÷ 100) m = 3 m.**

Change from centimetres to metres :-

a 200 cm b 450 cm c 50 cm d 1000 cm.

5. **2 km = (2 x 1000) m = 2000 m.**

Change from kilometres to metres :-

a 7 km **b** 2·5 km **c** 0·5 km **d** 0·25 km.

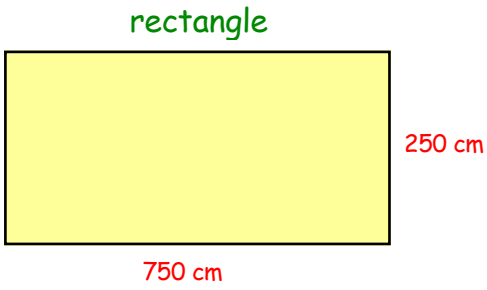
6. **5000 m = (5000 ÷ 1000) km = 5 km.**

Change from metres to kilometres :-

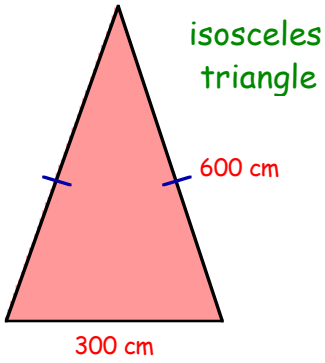
a 3000 m **b** 6400 m **c** 500 m **d** 20 m.

7. Find the **perimeter** of each of these shapes (in centimetres) and give your final answer in **metres** :-

a



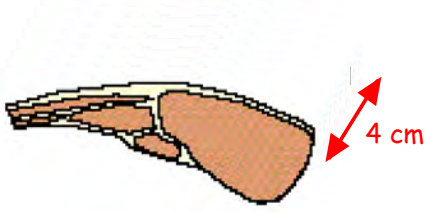
b



8. Kip ran 8 laps around a 400 metre race track.

How far did he run, (in kilometres) ?

9.



A pack of 8 slices of bacon is 4 cm deep.

Calculate the thickness of 1 slice of bacon, (in mm).

10. Sandy's ball lands 8 metres from the hole on a green during the "Open".

His 8 metre putt stops 50 centimetres short of the hole.

How far had he hit his putt, (in metres)
(*8 metres – 50 centimetres*) ?

11.

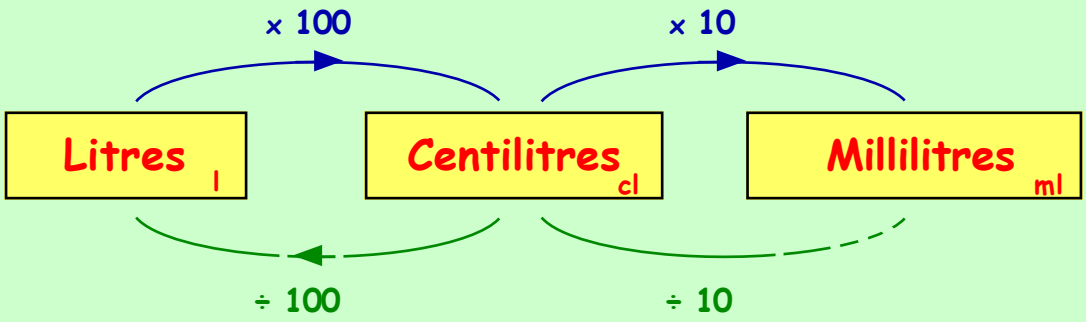
James lives 750 metres from his school.

He walks there **and back** 5 days a week.

How many kilometres does he walk in total on his way to and from school over these 5 days ?

Converting Volumes (litre cl and ml)

Rules For Changing

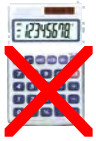


Volume conversions are carried out in a similar way to length conversions.

Examples :-

1. 2 **litres** = (2 × 100) **centilitres** = **200 cl**
2. 80 **millilitres** = (80 ÷ 10) **centilitres** = **8 cl**

Exercise 2



1. Change from litres to centilitres :-
   a 5 litres b 3·5 litres c 0·2 litres.
2. Change from centilitres to litres :-
   a 600 cl b 1500 cl c 80 cl.
3. Change from centilitres to millilitres :-
   a 5 cl b 70 cl c 0·4 cl.
4. Change from millilitres to centilitres :-
   a 400 ml b 90 ml c 5 ml.

REMEMBER :- 1 litre = 1000 ml.

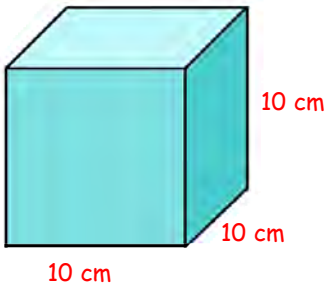
5. Change from litres to millilitres :-
   a 3 litres b 35 litres c 0·7 litres.

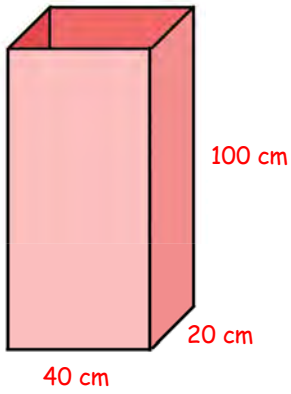
6. Change from millilitres to litres :-

a 8000 ml **b** 5000 ml **c** 3500 ml.

REMEMBER :- 1000 cubic centimetres = 1 litre (i.e. 1000 cm^3 = 1 litre)

7.





Using the formula for the volume of a box :-

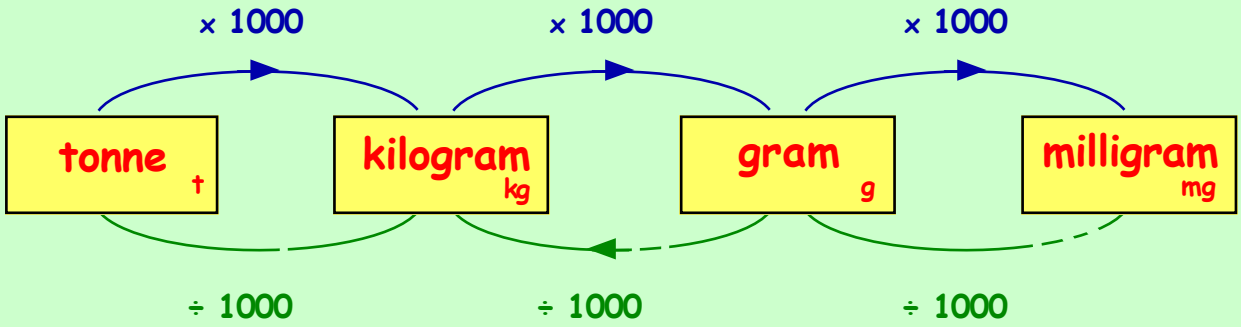
$V = L \times B \times H$,

a Find the **volume** of each box, in cm^3.

b How many litres of water would each box hold, if full ?

Converting Weights (tonne kg g mg)

Rules For Changing



Weight conversions are similar to the others, but here, the x and ÷ are always by **1000**.

Examples :-

1. 3 **tonnes** = (3 x 1000) **kilograms** = **3000 kg**
2. 4000 **milligrams** = (4000 ÷ 1000) **grams** = **4 g**

Exercise 3

1. Change from kilograms to grams :-

a 2 kg **b** 8 kg **c** 4·2 kg.

2. Change from milligrams to grams :-

a 5000 mg **b** 18 000 mg **c** 400 mg.

3. Change from tonnes to kilograms :-

a 2 tonnes **b** 9 tonnes **c** 6·5 tonnes.

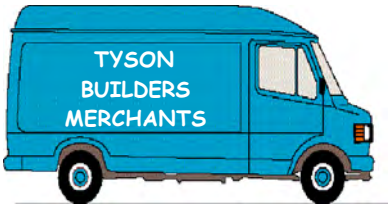
4. Change from grams to kilograms :-

a 2000 g **b** 500 g **c** 17 000 g.

5. An empty van weighs 2640 kg.

When it is filled with stone chips it weighs 4·41 tonnes.

What is the weight of the stone chips ?



6.

Maisie weighed 42·6 kg.

She went on a "crash diet" and lost 1200 grams.

What is Maisie's new weight ?

7. A local grocer ordered 0·25 tonne of loose coffee which he packed into 1 kg bags for sale.

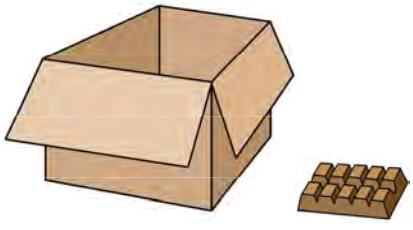
How many bags did he fill ?

8. A joiner went to a DIY store and purchased the following items :-

- 5 bags of screws, each weighing 500 grams
- 10 small planks of wood, each weighing 1800 grams
- 1 hammer weighing 500 grams
- 1 large tub of glue weighing 1 kg

Find the **total weight** of his purchases in :- **a** grams **b** kilograms.

9.



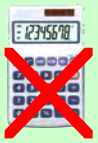
An empty box weighs 200 grams.

It is filled with 25 bars of chocolate, each weighing 50 grams and 10 packets of crisps each weighing 25 grams.

Find the weight of the full box in :-

a grams **b** kilograms.

What Have I Learned ?



1. Change :-

a 2·6 cm into mm **b** 400 mm into cm **c** 0·7 metres into cm

d 40 cm into metres **e** 3·2 km into metres **f** 7500 metres into km.

2. Kevin lives 1·2 km from his office.

He jogs there and back 5 days a week.

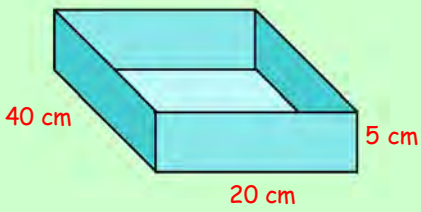
How many **metres** does he jog each week ?

3. Change :-

a 7 litres into cl **b** 40 cl into litres **c** 6 cl into ml

d 50 ml into cl **e** 9 litres into ml **f** 4200 ml into litres.

4. Calculate the volume of this tray, in cm^3.



5. Change :-

a 8·4 kg into grams **b** 2000 mg into grams **c** 4500 kg into tonnes.

6. A gardener bought 0·12 tonne of compost.

He placed 1 kg of compost into each of his seed trays.

How many seed trays did he manage to fill ?

7. **Copy** and do the following :-

a
$$\begin{array}{r} 5{\cdot}69 \\ +\ 3{\cdot}78 \\ \hline \\ \hline \end{array}$$

b
$$\begin{array}{r} 15{\cdot}71 \\ -\ 9{\cdot}67 \\ \hline \\ \hline \end{array}$$

c
$$\begin{array}{r} 0{\cdot}86 \\ \times\ 9 \\ \hline \\ \hline \end{array}$$

d $6\overline{)53{\cdot}4}$

e 9·42 x 10 **f** 3004 ÷ 100 **g** 0·658 x 100 **h** $\frac{875}{1000}$.

8. Round to **1 decimal place** :-

a 5·47 **b** 12·14 **c** 6·15 **d** 0·96.

9. Round to **2 decimal places** :-

a 11·684 **b** 9·435 **c** 0·898 **d** 0·1395.

CHAPTER 20

Percentages 2

Expressing One Quantity as a Percentage of Another

Two steps are taken to find the percentage of one quantity compared to another.

Step 1 :- Write it as a **fraction** first.

Step 2 :- Change the fraction into a percentage by "multiplying it by 100".

Example :- Of the 20 pupils in my Physics class, 10 are boys.
What percentage is this ?

Step 1 :- (**Fraction**) - $\frac{10}{20}$ (10 out of 20) are boys

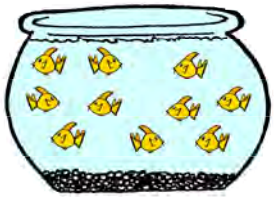
Step 2 :- (**Make into % by x 100**) $\frac{10}{20} \times 100 = 50\%$ ← use a calculator here if you must

Exercise 1

1. Write a **FRACTION** for each of the following :-

a Of the 20 pupils in my Chemistry class, 5 are boys.
What fraction of the class are boys ?

b In a field, there are 40 animals, of which 3 are horses.
What fraction of the animals in the field are horses ?



c Of the 80 fish in my fish bowl, 70 are goldfish.
What fraction of all the fish in the bowl are :-
(i) goldfish **(ii)** others ?

d

Last evening, I noticed that 6 of my microwave chips were bad.
If there were a total of 30 in the box, what fraction of the chips were bad ?

e I go to school 5 days a week.
What fraction of the whole week do I actually go to school ?

f Thirty six boys and sixty girls go on a school trip.
What **fraction** of the pupils are :- **(i)** boys **(ii)** girls ?

2. Change the following fractions into percentages by **multiplying by 100** :-

a	$\frac{3}{4}$ (x 100)	**b**	$\frac{1}{4}$	**c**	$\frac{1}{20}$	**d**	$\frac{1}{5}$
e	$\frac{4}{5}$	**f**	$\frac{3}{8}$	**g**	$\frac{7}{20}$	**h**	$\frac{1}{10}$
i	$\frac{9}{10}$	**j**	$\frac{20}{40}$	**k**	$\frac{3}{100}$	**l**	$\frac{60}{80}$.

3. In a spelling test, Lynsey got five out of ten, David got seven out of ten and Todd only got one out of ten.

Change their marks into percentages.

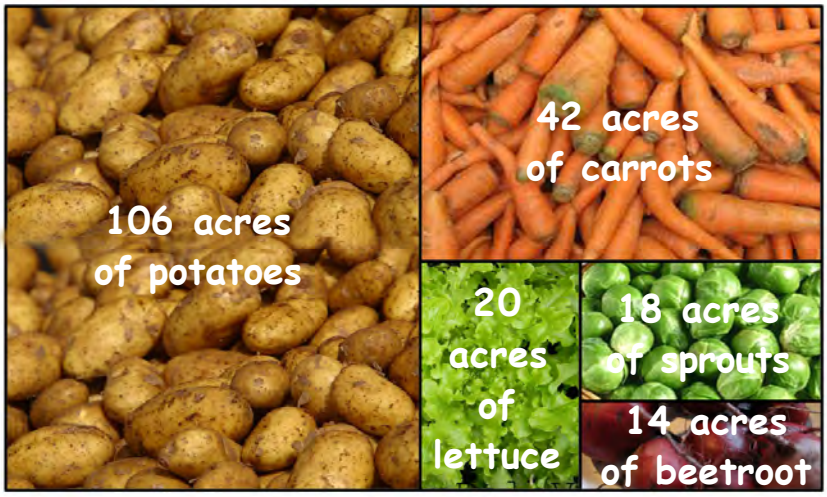
4. Theresa got $\frac{30}{40}$ for Biology and $\frac{48}{60}$ for Chemistry.

Change both marks into percentages. In which subject did Theresa perform better ?

5. A gardener owns a 200 acre plot of land.

This table shows how he divides his plot when growing vegetables.

Calculate the percentage of the total area used for **each vegetable**.



6. Mrs Thomson's council tax was calculated to be £120 per month.

This year it rose by £48.

What was this year's increase as a percentage of the £120 ?

7.

A P.E. class of 25 were given a choice from 4 different sports.

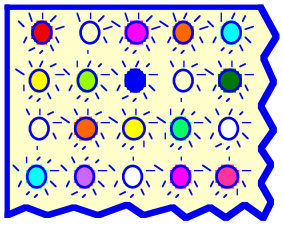
Each had to pick one sport and master it.

- 10 chose table tennis
- 2 chose badminton
- 6 chose squash
- 7 chose archery

Calculate what percentage of the class took part in each sport.

8. Of the 1600 coloured lightbulbs used in a flashing roadside advertisement, 40 were found to be faulty.

What percentage was that ?



9. In a survey, 50 children were asked to sample 5 different types of drinks.

The result of the survey is shown in the table opposite.

Find the percentage of children who chose each type of drink.

orange	15
cola	20
lemon	7
lime	6
blackcurrant	2

10. By increasing his prices, Mr Fixit, the ironmonger, made a £1 profit out of every £20 worth of goods he sold.

What was his percentage profit ?

Percentage Profit / Loss

Example :- I bought a bicycle for £80 and sold it later for £90.

What **percentage profit** did I make ?

Step 1 :- Find the actual profit (or loss).

Step 2 :- Form a fraction by putting the actual profit **over** the initial cost.

Step 3 :- Change the fraction into a percentage by (x 100).

Actual Profit = £90 – £80 = £10.

Fraction = $\frac{10}{80}$ ← profit / initial cost

% Profit = $\frac{10}{80}$ x 100

= **12·5%** (by calculator)

Exercise 2

In this exercise, round your answers to 1 decimal place where required.

1. Calculate the profit (or loss) as a percentage of the cost price :-

a Pens, bought for 10p each, are then sold for 12p each.

b Sweatshirts, bought for £20 each, are then sold for £25 each.

c Golf balls, bought for £1 each, are then sold for £1·50 each.

d Magazines, bought for £4·80 each, are then sold for £5·28 each.

e Blank C.D.'s, bought for 40p each, are then sold for £2·00 each !!

2.

Zahir Traders Independent buys door locks and keys for £3·60 each and sell them to the public for £4·50 each.

Calculate the profit **and** the percentage profit made on a single door lock.

3. 

Football boots are bought for £40 per pair and sold for £50 by a sport's shop.

Calculate the profit **and** the percentage profit made on a single pair of football boots.

4. This digital camera was bought for £200.

It was later sold for a small profit at £202.

Calculate the profit **and** the percentage profit.

5. 

A gift shop purchases glasses for £15 and sells them at £19.

Calculate the percentage profit.

6. This car was bought for £12 000.

After 2 years, the owner sold it for £9000.

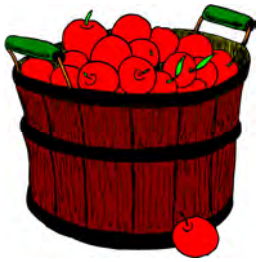
What was his **percentage loss** ?

£12 000

7. "Greenland", the frozen food outlet chain, buy "Granny's Cherry Pies" in boxes of 20 for a total cost of £30.

The cherry pies are then sold to shops for £1·80 **each**.

Calculate the percentage profit made by "Greenland", when they sell a full box of Granny's pies.

8. 

A greengrocer bought a barrel of 40 apples for £4.

She threw out 6 bad apples and **sold the rest** at 10p each.

a Did she make a profit or loss ?

b Calculate her **percentage profit/loss**.

Percentage Increase and Decrease

Example :- A tutor charged £18 per hour in 2007. By the year 2012, he was charging £22·50 per hour. Calculate his **percentage increase**.

Step 1 :- Find the actual increase (or decrease).

Step 2 :- Form a fraction by putting the actual increase **over** the original value.

Step 3 :- Change this fraction into a percentage by **multiplying by 100**.

Increase = £22·50 – £18 = £4·50.

Fraction = (4·5 ÷ 18) = $\frac{4·5}{18}$

% Increase = $\frac{4·5}{18}$ x 100

= 25% (by calculator)

Exercise 3

1. A paper boy used to be paid £8 per weekend, but the newsagent increased his pay to £10.

a Calculate his actual increase.

b Calculate his percentage increase.

2. Lucy Green received a rise in her salary which took her pay from £14 000 to £14 980 per year.

a What was her increase ?

b Calculate Lucy's percentage increase.

3.

Member of Parliament, Donnie Finlay, received 8400 votes at the 2006 General Election.

At the election of 2010, the number of votes he received dropped to 7140.

a Calculate the actual decrease in his votes.

b Calculate the percentage decrease in votes.

4. Senior citizens received an increase in their pensions from £95 to £96·50 per week.

Calculate the percentage increase in their pensions, (*to 1 decimal place*).

5.

At the Seve Ballasteros Golf Tournament in Ireland, the attendance figure for the first day was 20 000.

On the second day, the pouring rain meant a poor attendance of only 6 000.

Calculate the percentage decrease from day 1 to day 2.

6. The temperature rose from 12°C to 21°C between 6 am and noon.

Calculate the actual rise in temperature and express this as a percentage of the original 12°C temperature.

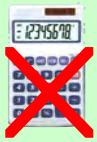
7.

In an African nature reserve, the population of elephants grew from 120 in 2000 to 190 in 2010.

a What was the increase in the elephant population ?

b Express this as a percentage of the 2000 elephant population, (*to 1 decimal place*).

What Have I Learned ?



1. Write each of the following as a decimal and as a percentage :-

a $\frac{1}{4}$ **b** $\frac{2}{5}$ **c** $1\frac{3}{8}$ **d** $\frac{2}{3}$.

2. Calculate :-

a 10% of £1450 **b** 75% of £12 **c** $33\frac{1}{3}$ % of £150

d 15% of 40 ml **e** 37% of 200 km **f** 6% of 1240 kg.

3. **a** Lenny wants to buy a motorcycle costing £3260, but the price has increased by 8%.

How much will he now have to pay ?

b Kay buys a £60 dress and gets a 20% discount.

How much did she pay for the dress ?

4. Write each of these as a fraction in its simplest form :-

a James scored 15 out of 30 in his English Test.

b There were 24 girls in a class of 40 pupils.

5. Change each fraction in question **4** to a percentage.

6. Hayleigh scored 12 out of 20 in her Geography test.

Find her percentage mark.

7. 

Last month, a computing games pad cost £240.

This month it costs £288.

Calculate the percentage increase.

8. **a** Zak bought a new watch for £60.

He later sold it for £45.

Calculate his loss and write this loss as a percentage of the cost price.

b Hannah bought a riding crop for £40. She then sold it for £50.

Find her percentage profit.

CHAPTER 21

Enlargement 2

Scale and Enlargement

Here is a picture of Andy.

He is 7·5 cm tall in the picture.

In real life, Andy is actually **twenty times** the size he appears to be in the picture.

We say that this picture has "**a scale of 1 cm to 20 cm**", which tells us that the "real life" Andy is twenty times the size of the one which we see here in the picture.

(i.e. 20 x 7·5 = **150 cm**)

Exercise 1

1. Here are some "**scales**".

   What number would you have to multiply any measurement by to arrive at the "**real life**" size ?

   a 1 cm to 8 cm **b** 1 m to 100 m **c** 1 m to 6 m

   d 1 cm to 1 metre **e** 1 : 9 ("one to nine") **f** 1 : 100.

2. More "**scales**".

   You would have to divide any real length by the scale number to reduce the "**real life**" situation into a "**model**" or "**photograph**" situation.

   What would you **divide** by here to reduce the "real life" to the "model" situation :-

   a 1 cm to 10 cm **b** 1 m to 50 m **c** 1 : 5

   d 1 : 30 **e** 1 m to 10 km **f** 1 mm to 2 cm.

   careful

3. Use a ruler to measure these lines and use the given scales to find the "**real life**" distance the lines represent :-

   a ——————— Scale 1 cm to 10 cm (length x 10)

   b ——— Scale 1 cm to 100 cm

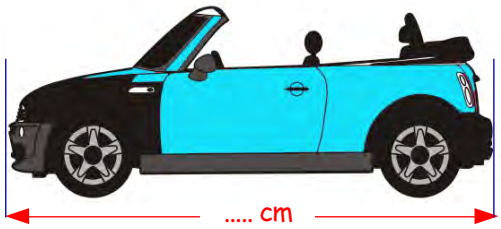
   c ——————— Scale 1 : 10

   d ——— Scale 1 : 100

   e ——————— Scale 1 cm to 1 m

   f ——————— Scale 1 cm to 1 km.

4. This model car was made to a scale of 1 cm to 50 cm.



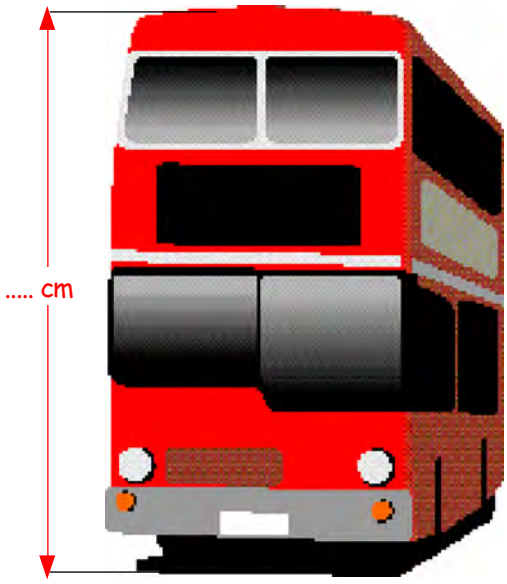
a Measure the length of the car in the drawing above.

b Use the scale (1 cm = 50 cm) to find the length of the real car.

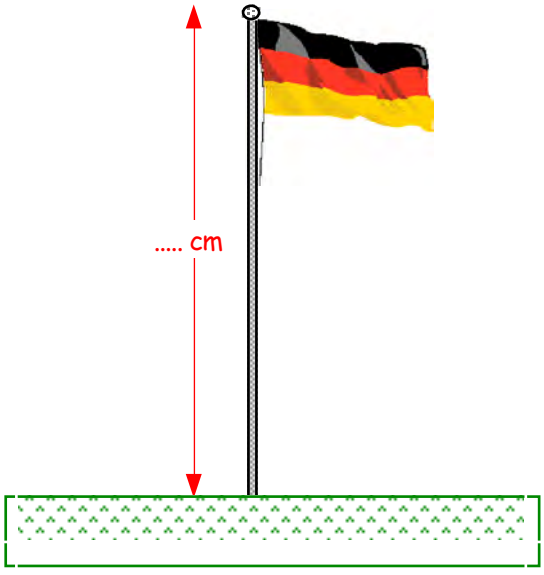
5. The model bus is made to the scale of 1 cm to 80 cm.

a Measure the height of the bus.

b Calculate the height of the real bus.



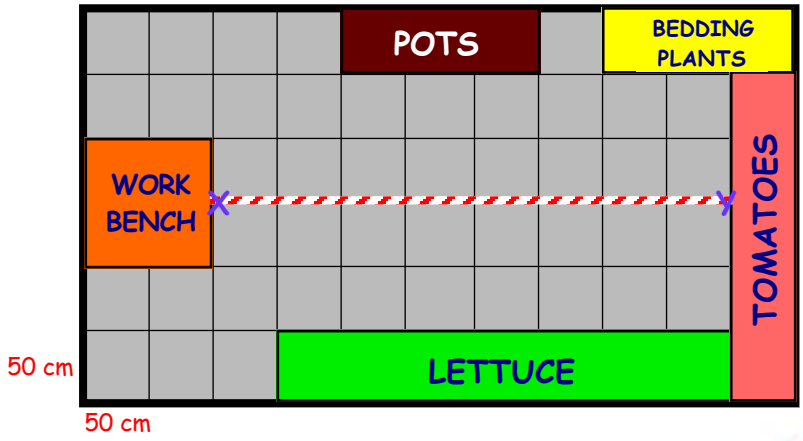
6. The flagpole has a scale of 1 cm to 120 cm.



a Measure the height of the flagpole.

b Calculate its real height.

7. The side of each small square represents 50 cm in this scale drawing of a greenhouse.



a Calculate the **real** length of :-

(i) the row of pots.

(ii) the row of tomatoes.

(iii) the trays of lettuce.

(iv) the trays of bedding plants.

b The gardener walks in a straight line from his work bench (X) to the tomatoes (Y).
How far did he really walk ?

Calculating Lengths using Scales and Scale Factors

Example :- A model van is 8 centimetres long.

The scale of the model is 1 : 50.
(*This means that the **scale factor** for the question is **50***).

Calculate the real length of the van.

Solution :-

Real length of van = 50 x model length
= 50 x 8 cm
= **400 cm** (or 4 metres)

Exercise 2

1. Calculate the **real** lengths of these models, given their model lengths and their scale factors :-

a A model bus, length 10 cm. (Scale factor 50).

b A model ship, length 20 cm. (Scale factor 100).

c A model steam engine, length 5 cm. (Scale factor 200).

d A model aeroplane, length 12 cm. (Scale factor 250).

2. 

A photograph shows that Charlie is 15 cm tall.

The scale of the drawing is 1 : 10.

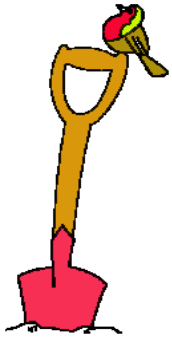
What is Charlie's **real** height ?

3. Mary's foot is TWICE the length of her baby sister's.

Her sister's foot is 8·8 centimetres long.

a Write down the **scale factor** here.

b What size are Mary's feet ?

4. 

Harold has drawn up a plan of his rectangular garden.

The drawing is 15 centimetres long and 10 centimetres wide.

The scale of his garden on the map is given as 1 : 50.

a Write down the scale factor.

b **(i)** Calculate the **length** of the actual garden.

(ii) Calculate the **width** of the actual garden.

Calculating Model Lengths knowing Scale Factor

Example :- A van is 400 cm long.

A model of this van is made 50 times smaller than the actual van.

Find the length of the model.

(*This time, though the scale is still 1 : 50, the scale factor is* $\frac{1}{50}$).

—> This will **reduce** the length of the real van !!!

Solution :-

Length of model = $\frac{1}{50}$ × real length

= $\frac{1}{50}$ × 400 cm (= 400 ÷ 50)

= **8 cm**

5. Calculate the heights of these models, given their **real heights** and scale factors :-

a A van 150 cm high. (Scale factor $\frac{1}{50}$)

b A lorry 300 cm high. (Scale factor $\frac{1}{50}$)

c A bicycle 120 cm high. (Scale factor $\frac{1}{2}$)

d A train 4 metres high. (Scale factor $\frac{1}{100}$)

e Mr Smith's house 5 metres high. (Scale factor $\frac{1}{20}$).

6.

Sir Francis has a model of his yacht on top of his dining room table.

The scale of the model is 1 : 20.

If the length of his real yacht is 15 metres, what is the length of his model ?

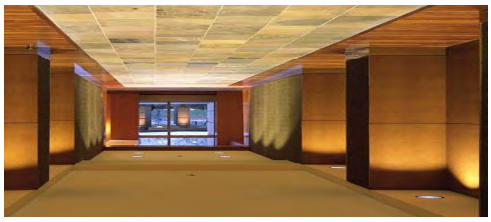
7. The giraffe in this picture is $\frac{1}{50}$ real life size.

If the actual giraffe is 4 metres tall, what will the height of the giraffe in the picture be ?

8. The scale of an ordinance survey map is 1 : 1000.

What would the length of a path be on a map, if the real length of the path is 100 metres ?

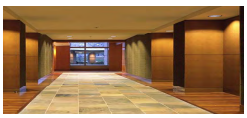
9. The two pictures shown below are rectangular.



32 cm

12 cm

reduced



4 cm

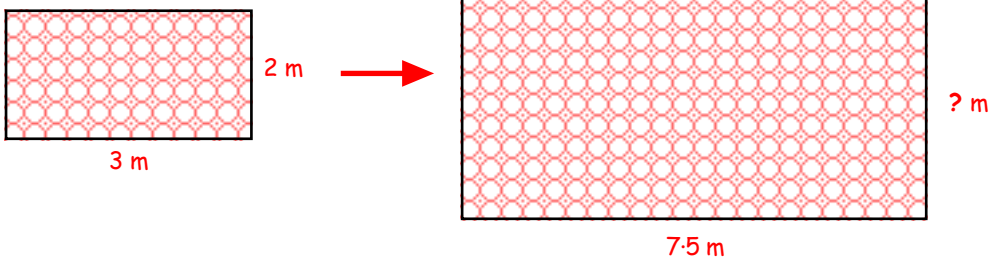
? cm

The smaller one is **similar** to the larger, but naturally it has been reduced in size.

a Look at the length of the longer side in each rectangle and state by how much the larger rectangle has been reduced. ($\frac{1}{4}$, $\frac{1}{2}$, $\frac{1}{5}$ .... ?)

b Use this information to find the height of the smaller rectangle marked **?** cm. (Do not measure it)

10. These carpets are similar, but the second one is an enlargement of the first one.



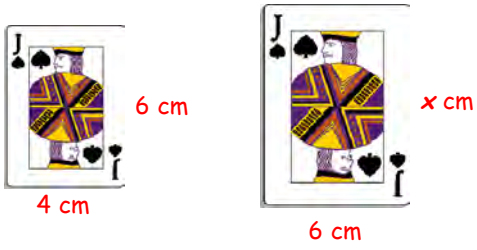
a Write down the scale factor from the smaller carpet to the larger one. (*It is **not** a whole number*).

b Use this information to find the breadth of the larger carpet (marked **?**).

11. These playing cards are similar.

a Write down the scale factor from the smaller card to the larger one.

b Use this information to find the length of the side of the card marked ***x*** cm.

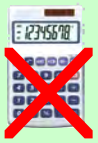


12. Mother flamingo has a daughter who is an exact replica of herself, but of course is smaller.

a If mother's height is 90 cm and daughter's height is 30 cm, write down the scale factor from mother to daughter.

b Mum's beak is 15 cm long. How long will the daughter's beak be ?

What Have I Learned ?



1. What number would you multiply by to obtain the **real life** size, using these scales ?

a 1 m to 200 m **b** 1 mm to 1 cm **c** 1 cm : 5 km ?

2. What would you divide by in these to reduce a **real life** to a **model** situation ?

a 1 cm to 60 cm **b** 1 m to 5 km **c** 1 mm : 10 cm ?

3.

The picture shows that a truck is 10 cm in height.

The scale of the picture is 1 : 40.

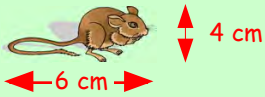
What is the truck's real height, in metres ?

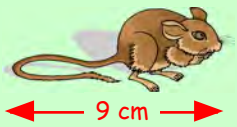
4. George has a toy bus, the same make as the one his dad drives.

The scale of the toy is 1 : 80.

If the length of his dad's real bus is 1200 cm, what is the length of George's toy ?

5.





Here is a mother mouse with her identical, but smaller baby.

The baby is 6 cm in length, the mother is 9 cm.

a Write down the scale factor from the smaller mouse to the larger one. (*It is **not** a whole number*).

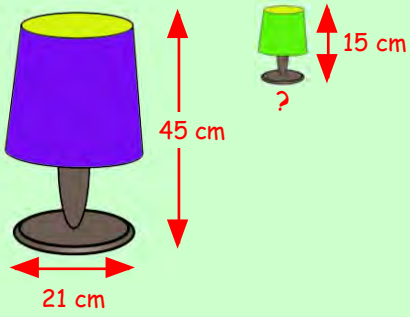
b If the baby is 4 cm tall, how tall is its mother ?

6. These table lamps are similar to each other.

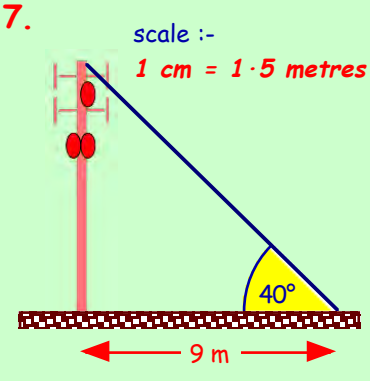
One is smaller than the other and has a different coloured shade.

a Write down the scale factor from the large lamp to the small one.

b Calculate the width of the base on the small lamp if the large one has base 21 cm.



7.



A wire is attached from the top of a mobile phone tower to a point 9 metres from its base.

a Make a scale drawing of the tower and wire.

b Measure the height of the tower on your scale drawing, in centimetres.

c Now calculate the **real** height of the tower, in metres.

CHAPTER 22

Inequalities

Inequalities are sometimes used when there is more than one answer in a solution.

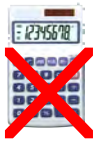
Learn these signs :-

$>$ "greater than"	$\geq$ "greater than or equal to"
$<$ "less than"	$\leq$ "less than or equal to"

Examples :-

$8 > 7$	"eight is greater than seven"
$-3 < -1$	"negative three is less than negative one"
$x \geq 5$	"x is greater than or equal to five" (x can be **5 or above**)

***Note** the arrow (<), (>) always points to the smaller number.



Exercise 1

1. **COPY** the following and enter a "<" sign, a ">" sign or an "=" sign in the correct place :-

a	2 1	**b**	-1 2	**c**	0 6
d	5 3	**e**	4 .... 2 + 2	**f**	-5 .... -6
g	1 .... -8	**h**	15 .... -15	**i**	-7 .... -8
j	0 .... -11	**k**	-1 0	**l**	-100 .... -99
m	18 ÷ 2 ... 3 x 3	**n**	49 ÷ 7 ... 4 + 5	**o**	$\sqrt{64}$ ... 3 squared.

2. In this question, you can choose x from the numbers { 0, 1, 2, 3, 4, 5 } :-

e.g.

for $x \geq 4$	(x can be 4 or 5)	$x = 4, 5$
for $x < 3$	(x can be 0, 1 or 2)	$x = 0, 1, 2$

a	$x > 3$, (so x = ...)	**b**	$x \leq 1$	**c**	$x > 4$
d	$x \leq 5$	**e**	$x < 1$	**f**	$x \geq 1$
g	$x < 4$	**h**	$x > 5$	**i**	$x > 2$.

3. In this question, you can choose x from the numbers { -2, -1, 0, 1, 2, 3 } :-

a	$x > 1$	**b**	$x < 0$	**c**	$x > -1$
d	$x < 2$	**e**	$x \geq 2$	**f**	$x \leq 0$.

4. In this question, you can choose y from the numbers { 1, 2, 3 ... up to ... 10 }.

e.g. Solve $y + 1 > 8$

is 1 (+ 1) greater than 8 – **no**	is 2 (+1) greater than 8 – **no**
is 3 (+ 1) greater than 8 – **no**	is 4 (+1) greater than 8 – **no**
is 5 (+ 1) greater than 8 – **no**	is 6 (+ 1) greater than 8 – **no**
is 7 (+ 1) greater than 8 – **no**	is 8 (+ 1) greater than 8 – **yes**
is 9 (+ 1) greater than 8 – **yes**	is 10 (+ 1) greater than 8 – **yes**

(**Stop** here since 10 is the largest number to consider)

y must be 8, 9, or 10 So y = **8, 9, 10.**

Solve the following for { 1, 2, 3 ..... up to 10 } :-

a $y + 3 > 7$ **b** $y + 1 > 3$ **c** $y + 2 < 9$

d $y + 5 > 12$ **e** $y + 2 \leq 4$ **f** $y + 1 \leq 5.$

Examples :-

1.

$x + 2 > 5$
$\Rightarrow \quad x > 3$

Do as if $x + 2 = 5$
$x = 3$
with a > sign

2.

$4x < 20$
$\Rightarrow \quad x < 5$

Do as if $4x = 20$
$x = 5$
with a < sign

3.

$2x + 1 = 9$	**notice**	$2x + 1 > 9$
$2x = 8$		so $2x > 8$
x = **4**		x > **4**

Inequalities or inequations can be solved in the same way as equations.
The only difference is that you use the $<, >, \leq, \geq$ signs instead of the "=" signs.

5. Solve these inequalities, leaving your answers as in the worked examples shown above, i.e. $x > 3$, etc. :-

a $x + 1 > 3$ **b** $x + 4 > 9$ **c** $x + 7 \leq 8$

d $5x < 15$ **e** $6x > 30$ **f** $2x \leq 7$

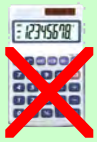
g $3x + 1 > 4$ **h** $2x - 4 < 6$ **i** $5x + 1 \geq 21$

j $7x - 2 \leq 26$ **k** $10x + 1 > 101$ **l** $2x - 8 \leq 4$

m $4x + 4 > 18$ **n** $6x - 2 < 7$ **o** $2x + 7 \leq 18$

p $2(x + 1) > 8$ **q** $3(x + 2) < 12$ **r** $5(x - 1) \geq 20.$

What Have I Learned ?



1. Simplify :-

a	$7t + 4t$	**b**	$3k + 8k - k$	**c**	$11p - 1 - 7p$
d	$4x + 2 - x + 1$	**e**	$b + 3h + 2b - 3h$	**f**	$12p + 6q - 5p - 4q$.

2. Work out the brackets :-

a	$6(p - 3)$	**b**	$8(w + 8)$	**c**	$9(j + g)$
d	$7(4y + 3)$	**e**	$6(3a - b + 2c)$	**f**	$\frac{1}{2}(10p + 6q + 3r)$.

3. Multiply out the brackets and then simplify :-

a	$4(q - 1) + 5$	**b**	$2 + 3(4k + 5)$	**c**	$4(a + b) + 2(3a + 1)$.

4. Solve :-

a	$r + 6 = 13$	**b**	$11 - g = 7$	**c**	$3b = 21$
d	$6t = 21$	**e**	$7d + 3 = 24$	**f**	$5m - 3 = 17$
g	$6(k - 2) = 36$	**h**	$5y + 2 = 2y + 26$	**i**	$15h - 10 = 3h - 10$.

5. **COPY** and enter a "$<$" sign, a "$>$" sign or an "$=$" sign in the correct place :-

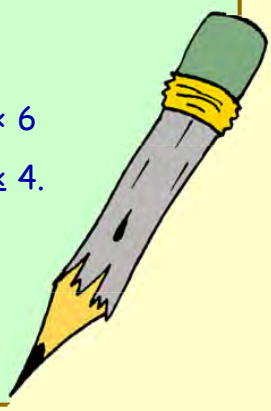
a	5 4	**b**	-7 .... -2	**c**	-3 1
d	15 23	**e**	14 .... 7 x 2	**f**	-151 .... -156.

6. In this question, you can choose x from the numbers { -2, -1, 0, 1, 2, 3 } :-

a	$x > -1$	**b**	$x < -1$	**c**	$x > 1$
d	$x < 3$	**e**	$x \geq 0$	**f**	$x \leq -2$.

7. Solve each inequality :-

a	$x + 1 > 5$	**b**	$x + 3 \leq 6$	**c**	$5x > 20$
d	$2x \leq 17$	**e**	$5x + 1 > -4$	**f**	$3x - 3 < 6$
g	$15x + 1 \geq 31$	**h**	$9x - 2 \leq 25$	**i**	$3x - 8 \leq 4$.



CHAPTER 23

Time, Distance, Speed 2

Hours & Minutes to Decimals

In Chapter 10 you learned the following :-

30 minutes = $\frac{1}{2}$ **hour** = **0·5 hour**

15 minutes = $\frac{1}{4}$ **hour** = **0·25 hour**

45 minutes = $\frac{3}{4}$ **hour** = **0·75 hour**

These need to be **MEMORISED** now !!

If you wish to use a calculator involving times like 2 hours 12 minutes, you do **NOT** put **2·12** into the calculator.

Note :-

12 minutes = $\frac{12}{60}$ of an hour (not $\frac{12}{100}$).

=> 12 minutes = $\frac{12}{60}$ hour (= 12 ÷ 60) = **0·2** hour on a calculator.

=> 42 minutes = $\frac{42}{60}$ hour (= 42 ÷ 60) = **0·7** hour on a calculator.

Exercise 1

1. Use your calculator to change these minutes to decimals :-

a 24 minutes = $\frac{24}{60}$ hour (= 24 ÷ 60) = ... hour.

b 36 minutes **c** 6 minutes **d** 54 minutes **e** 21 minutes

f 51 minutes **g** 45 minutes **h** 3 minutes **i** 48 minutes.

2. Use your calculator to change these times to decimals.

Round your answers to **2 decimal places** :-

a 20 minutes **b** 40 minutes **c** 10 minutes **d** 5 minutes

e 50 minutes **f** 4 minutes **g** 35 minutes **h** 55 minutes.

3. Use your calculator to change these times to decimals :-

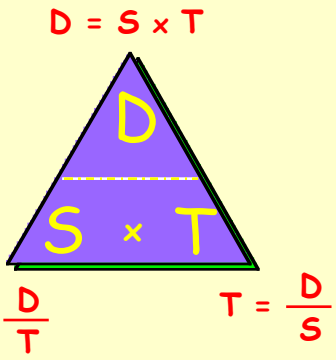
a 2 hours 36 minutes = $2 + \frac{36}{60}$ = 2 + (36 ÷ 60) = ... hours.

b 1 hr 48 mins **c** 3 hrs 12 mins **d** 5 hrs 27 mins **e** 2 hrs 32 mins

f 1 hr 54 mins **g** 6 hrs 3 mins **h** 5 hrs 10 mins **i** 4 hrs 40 mins.

4. ***Remember :-*** To calculate the **distance** travelled, you use the formula :-

$$D = S \times T$$



A car travels at 60 km/hr for 24 minutes.

How far does the car travel ?

Set down your working like this :-

D = S x T => D = 60 x ($\frac{24}{60}$) (*not 60 x 0·24*)

=> D = 60 x 0·4 (*calculator*)

D = ... **km**

5. A plane flies at 360 mph. How far will it travel in :-

a 36 minutes (= 360 x $\frac{36}{60}$) **b** 30 minutes **c** 12 minutes

d 42 minutes **e** 6 minutes **f** 51 minutes ?

6. For each of the following, calculate the distance travelled :-

a A train travelling at 80 km/hr for 48 minutes.

b A boat sailing at 20 miles/hr for 24 minutes.

c A cyclist cycling at 24 km/hr for 33 minutes.

d A van travelling at 45 mph for 20 minutes.

e A spaceship orbiting at 1200 mph for 15 minutes.

f A motorcyclist racing at 60 mph for 21 minutes.

7. Who has travelled further here :-

- Billy, who drives at 80 km/hr for 45 minutes
- Emma, who drives at 100 km/hr for 39 minutes ?

8. A train travels at 60 km/hr for 1 hour 24 minutes. How far does the train travel ?

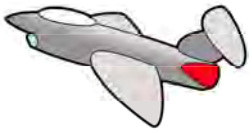
Set your working down like this :-

$D = S \times T \quad = 60 \times (1 + \frac{24}{60})$ calculator

$= 60 \times (1{\cdot}4)$ *(not 1·24)*

$=$ ..... **km**

9. What was the total distance travelled each time here ?



a A jet flies at 750 km/hr for 1 hour 18 minutes.

b A car is driven at 40 mph for 2 hours 36 minutes.

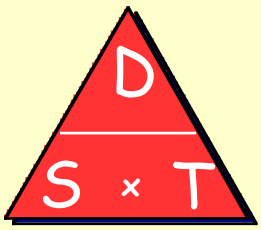
c A speedboat sails at 30 km/hr for 2 hours 20 minutes.

d A satellite circles at 2400 km/hr for 4 hours 48 minutes.

10. ***Remember :-*** To calculate the **speed** of anything, you use the formula :-

$$S = \frac{D}{T}$$

$D = S \times T$



$S = \frac{D}{T}$ $T = \frac{D}{S}$

A train travels a distance of 20 kilometres in 12 minutes.

Calculate its speed in km/hr.

Set down your working like this :-

$S = \frac{D}{T} \quad = 20 \div (12 \text{ mins})$

$= 20 \div (\frac{12}{60})$ *(**not** 20 ÷ 0·12)*

$= 20 \div 0{\cdot}2$

$=$ ..... **km/hr** *(calculator)*

11. Calculate the average speed, in mph or km/hr each time here :-

a A car covers 16 miles in 24 minutes.

b A plane flies 180 kilometres in 54 minutes.

c A hill walker covers 3 miles in 45 minutes.

d A jet plane travels 120 miles in 18 minutes.

e A train covers 170 km in 1 hour 42 minutes.

f A ship sails 81 miles in 2 hours 42 minutes.

g A rocket ship flies 2480 miles in 3 hours 6 minutes.

h A submarine travels 48 miles underwater in 2 hours 40 minutes.

12. The map shows the distances between three towns which lie on a bus route.

a The bus travels the 108 kilometres from Windsor to Kenilworth in 1 hour 48 minutes.
Calculate the **average speed** of the bus.

b If the bus continues to travel at this average speed, how long will it take to travel from Kenilworth to Cairns ?

Decimal Times to Hours and Minutes

In the previous exercise, you learned the following :-

To change minutes —> decimal times, you simply **DIVIDE** by 60.

In this next section you will learn how to change decimal time to minutes,

—> you simply **MULTIPLY** by 60.

Example :- How long does it take to drive 14 miles at 40 miles/hr ?

Set down your working like this :-

$T = \frac{D}{S}$ => $T = \frac{14}{40}$ = **0·35 hour**

note 0·35 hour does **not** mean 35 minutes

0·35 hours => (0·35 x 60) = 21 minutes (note)

$T = \frac{D}{S}$

To change decimal time to minutes —> **MULTIPLY** by **60**.

Exercise 2

1. The following calculator displays show times as decimals.

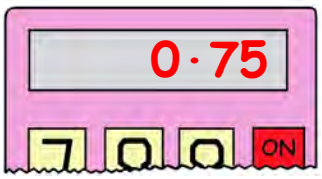
Change to minutes :-

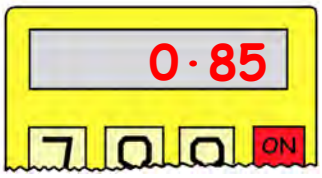
a 0·45 ON

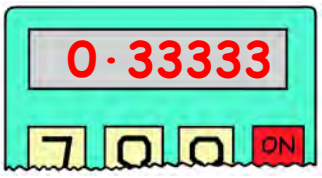
(0·45 x 60 = ...)

b 0·8 ON

c 0·1 ON

1. **d** 

e 

f 

Example :- To change **2·3 hours** to hours and minutes :-

— Leave the whole hours as they are (**2 hours**)
— Multiply the 0·3 by 60 => (**18 minutes**)
} **2 hours 18 minutes**

2. Change the following times to hours and minutes :-

a 1·6 hours = 1 hour + (0·6 x 60) minutes = **1 hour ..... minutes**

b 3·2 hours **c** 1·35 hours **d** 4·3 hours **e** 1·95 hours

f 5·6 hours **g** 1·66666.... hours **h** 0·166666.. hours **i** 2·65 hours.

3. A light plane covers 168 kilometres at 120 km/hr.

a Calculate the time taken in hours. ($T = \frac{D}{S}$) (*Give answer as a decimal*).

b Change your answer to hours and minutes.

4. A jogger covered a distance of 38·4 kilometres at an average speed of 12 km/hr.

a Calculate the time taken in hours (as a decimal).

b Change your answer to hours and minutes.

5. For each of the following journeys, calculate the time taken (as a decimal) and change the times to hours and minutes :-

a A plane flies 462 miles at an average speed of 140 mph.

b A train covers 135 kilometres at an average speed of 180 km/hr.

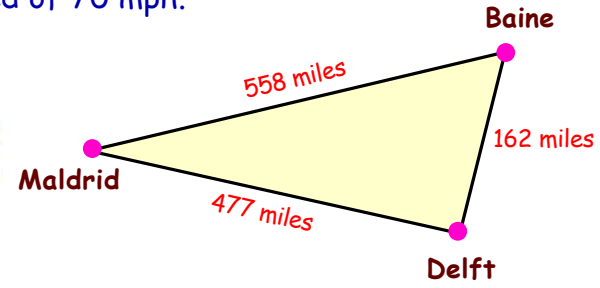
c A speedboat sails 27 kilometres at an average speed of 20 km/hr.

d A lorry covers 322 miles at an average speed of 70 mph.

6. The map shows 3 small European airports.

A light aircraft transports goods between the 3 airports.

The plane's average speed is 180 mph.



How long, in hours and minutes, should the plane take to fly between :-

a Maldrid and Baine **b** Baine and Delft **c** Delft and Maldrid ?

What Have I Learned ?

1. Change these times to decimals :-

e.g. 2 hours 36 minutes = $2 + \frac{36}{60}$ = 2 + (36 ÷ 60) = 2·6 hours.

a 12 minutes **b** 1 hr 6 mins **c** 3 hrs 45 mins **d** 6 hrs 48 mins.

2. Change the following times to hours and minutes :-

e.g. 3·6 hours = 3 hours + (0·6 x 60) minutes = 3 hours 36 minutes.

a 0·3 hours **b** 1·33333.. hours **c** 2·7 hours **d** 5·65 hours.

3. A plane flew 170 miles at an average speed of 340 mph.

How many minutes did it take ?

4. A hillwalker, moving at 2 km/hr took 1 hour 45 minutes to walk the whole length of a valley.

How far did she walk ?

5. 

A coach left Oban at 1350 and arrived at Dumfries at 1710.

If the distance of the journey was 200 km, what was the average speed of the coach ?

6. A police car travelled 15 miles along the motorway for 12 minutes.

Did it break the speed limit ? Explain.

7. A canoeist set off at 9.42 am and paddled 15·6 km at an average speed of 12 km/hr.

a How long did his journey last ?

b At what time did he arrive at his destination ?

8. Ryanjet flight RY747 leaves Glasgow for Dubai every Tuesday at 1450.

If the pilot manages to maintain an average speed of 450 mph he can cover the journey in 7 hours 12 minutes.

a At what time (British time) is the plane due to land in Dubai ?

b What is the distance from Glasgow to Dubai ?

CHAPTER 24

Using Mean, Median, Mode and Range

Remember :-

Mean = $\frac{\text{total of all the scores}}{\text{number of scores}}$

Range = highest – lowest

Earlier, we were asked to find the mean and range of a set of data.

Sometimes you are asked to compare different sets of data using the mean and the range.

Example :- Make some comparisons between these two sets of numbers :-

Set A - 4, 5, 7, 10, 11, 12, 14

Set B - 1, 2, 3, 6, 7, 14.

Set A

$$\text{Mean} = \frac{4+5+7+10+11+12+14}{7} = 9$$

Range = 14 – 4 = 10

Mean is **9**. **Range** is **10**.

Set B

$$\text{Mean} = \frac{1+2+3+6+7+14}{6} = 5{\cdot}5$$

Range = 14 – 1 = 13

Mean is **5·5**. **Range** is **13**.

Summary

Set B has a smaller average, but has a higher range (the numbers are more spread out).

you could also write

Set A has a higher average, but a lower range (the numbers are not so spread out).

NB You only need **one** of the statements above.

Exercise 1

1. Two sets of ages are shown below :-

Set A :- 5, 7, 8, 8, 11, 17, 21 **Set B :-** 11, 12, 14, 15, 16, 16

a Calculate the **mean** and **range** of set A.

b Calculate the **mean** and **range** of set B.

c Compare both sets of ages using the mean and the range.
(*Explain your comparison in a summary or a sentence*).

2. Each question below shows two sets of data.

Compare each by making a summary or sentence.

a 1, 2, 2, 6, 11, 12, 15
4, 4, 4, 7, 7, 10

b 1, 16, 22, 37
3, 4, 5, 6, 7, 8

c 111, 115, 127, 145, 157, 173
100, 104, 110, 111, 130

d 6·3, 7·1, 8·6, 9·0, 11·5
15·3, 11·3, 1·7, 6·4, 18, 15·7.

3. Jeff does six jobs for his parents and is paid the following amounts :-

£2, £9, £4, £12, £10, £5.

Sara also does some jobs for her parents and is paid :-

£6, £6, £8, £8.

Compare the two sets of payments.

4.

Mrs Mopp prefers Super Soap washing powder.

Over the course of a year she bought and noted the price of a large box.

Last year, when she lived in America she bought and noted the price of the same size of box.

The costs are shown in the table in £'s :-

Large Box Prices

Scotland	£9·50	£10·80	£8·60	£9·80	£8·30	£7·72
America	£4·50	£4·75	£4·80	£4·95		

a Calculate the **mean** cost for a large box of Super Soap in each country.

b How much **cheaper**, on average, is Super Soap in America than in Scotland ?

c **Compare** each set of prices.

5. The contents of nine delux boxes of chocolates are counted.

The boxes contain the following number of chocolates :-

12, 17, 15, 13, 13, 14, 10, 12, 11.

mean no. per box = 14

a The manufacturer claims that the mean number of chocolates per box is 14.

Is the manufacturer's claim correct ?

b What should the manufacturer's claim really be ?

c If a tenth box is examined, how many chocolates would it need to contain to make the manufacturer's claim correct ?

Remember :-

Mode = occurs most often

Median = the middle number

(*numbers must first be put in order*).

6. Find the **mean**, **median**, **mode** and **range** for each set of data :-

a 1, 4, 5, 6, 6, 7, 11, 13, 19

b 4, 4, 7, 12, 18

c 6·3, 5·2, 3·2, 6·3, 11

d 111, 62, 41, 73, 111, 55

e 1·7, 3·2, 1·7, 4·2, 3·2, 8, 3·2

f 1, 0, -3, 4, -1, 0, -5, 0, 3, 1.

7. Find the **mean**, **median** and **range** of the first ten :-

a square numbers

b prime numbers.

8. A data set is given as :- 1, 1, 15, 16, 18, 20, 23, 150.

a Find the **mean**, **median** and **mode**.

b Which of the three averages would be the most suitable ?
(*Explain your answer*).

9. Work out the mean, mode and median, then state the most suitable average.

Explain why you think the one you chose is the most suitable :-

a 11, 14, 11, 22, 75, 11

b 1·6, 2·0, 0·5, 2·0, 1·1, 0

10. A data set is given as :- 1, 50, 50, 50, 50, 50, 50, 50, 50, 50, 50, 50, 101.

Explain why the range, in this case, is **not** a suitable method of showing the spread.

11. Ten salesmen's commission (in £1000) are shown :-

£11K, £17K, £14K, £8K, £10K,
£23K, £16K, £14K, £5K, £9K.

The manager stated that the average commission is £12 500.

The Director stated that the average is £14 000.

The Chairman stated that £12 700 is the average.

Which of the three is correct ? *Explain*.

12.

The mean age of four boys is 16.

Three of the boys are aged 13, 14 and 17 years old.

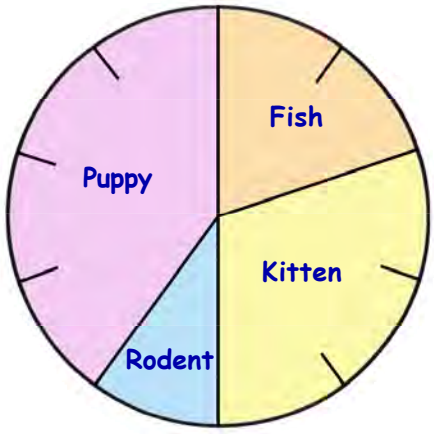
What is the age of the other boy ?

Interpreting and Drawing Pie Charts

Exercise 2

1. The pie chart shows the results of a survey into pets bought from a Glasgow pet shop.

Favourite Pet



a Write down the fraction (/10) of people who chose :-

(i) Kitten **(ii)** Fish

(iii) Rodent **(iv)** Puppy.

b List the pets in order, from **most** popular to **least** popular.

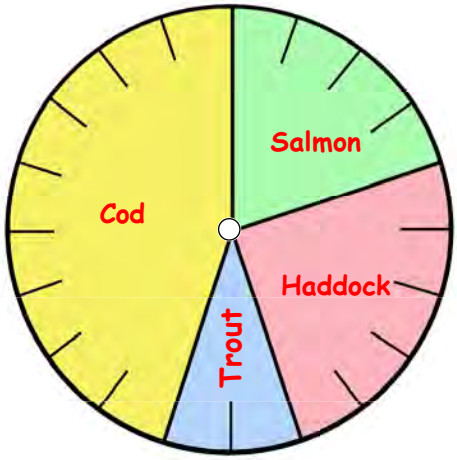
c If 300 people were asked, **how many** of them liked :-

(i) Fish **(ii)** Rodent

(iii) Kitten **(iv)** Puppy ?

2. This pie chart, showing the sale of fish in a supermarket chain one week, has been divided into **20 equal parts**.

Supermarket Fish Sales



a What percentage does each part stand for ?

b What percentage represents :-

(i) Cod **(ii)** Haddock

(iii) Trout **(iv)** Salmon ?

4000 fish were sold altogether that week.

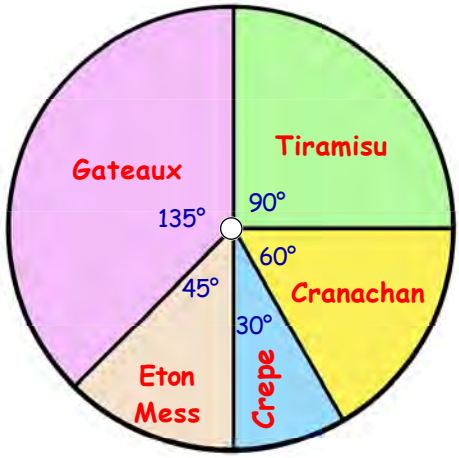
c **How many** of the fish sold were :-

(i) Haddock **(ii)** Salmon

(iii) Cod **(iv)** Trout ?

3. 24 chefs were asked to name their favourite desserts.

Favourite Pudding



a What fraction of them voted for Tiramisu ? $\frac{90}{360}$ - simplify

b What fraction of them voted for :-

(i) Eton Mess **(ii)** Cranachan

(iii) Crepe **(iv)** Gateaux ?

c Of the 24 chefs, how many voted for :-

(i) Tiramisu **(ii)** Crepe

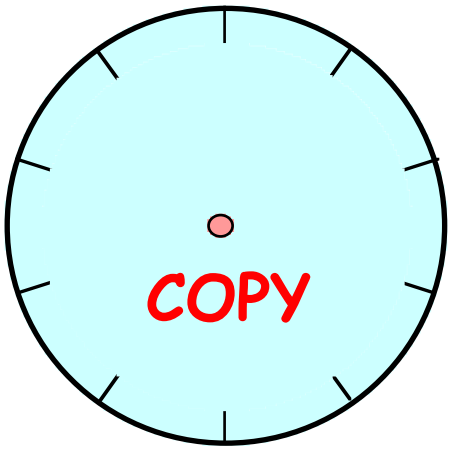
(iii) Cranachan **(iv)** Eton Mess ?

d How many did that leave voting for Gateaux ?

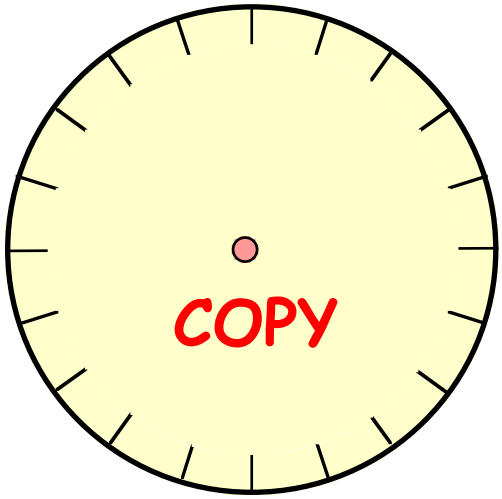
4. The percentage of cars sold in a garage forecourt were as follows :-

- 40% Family Saloons
- 30% Sports
- 20% 4 x 4's
- 10% MPV's

Copy (or trace) the blank **pie chart** and complete it, showing the above information.



5.



Over the course of a month, appointments at a doctors' surgery were collated. It was found that :-

- 45% of patients were aged over 50 years old
- 35% were between 20 - 49
- 15% were between 5 - 20 years old
- the rest were under 5 years old

a What percentage were under 5 years old ?

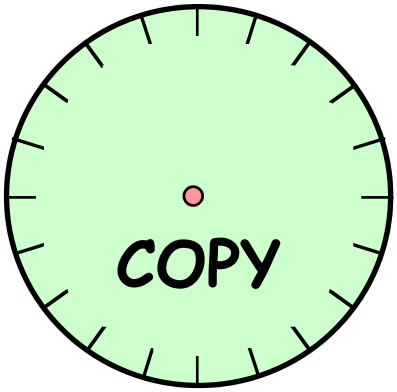
b Copy (or trace) the blank **pie chart** and complete it showing the above information.

6. The information given below shows the percentage answers to the question :-

"If you won a **very** large amount on the lottery, what would you do with the money" ?

- 45% for investment in the future
- 25% for spending this year
- half of the remainder to family & friends and the other half to charity.

Draw a pie chart to illustrate this, using a "pie" like this one.



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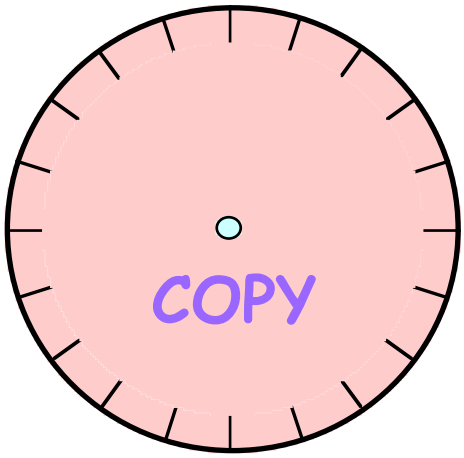


There were 8000 people at the Junior Cup Final.

- 3200 were supporting Arthurlie Juniors
- 2000 were Linlithgow Rose Juniors
- 2400 were neutral supporters
- the remainder were football officials and stewards.

a Copy (or trace) the blank pie chart and complete it to show the above information.

b What do you think is meant by "neutral" supporter ?

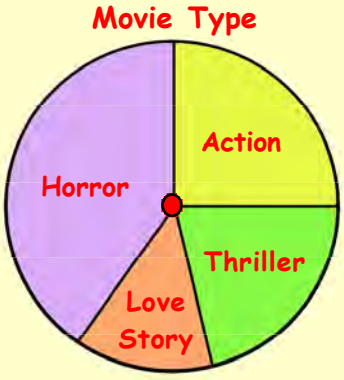
Drawing Pie Charts using a Protractor

The table of data shows a number of different movie types picked by third year pupils.

When drawing a pie chart, it is sometimes easier to add columns to the table for calculations.

Type of Movie	Number
Horror	36
Action	24
Thriller	20
Love Story	10

Type of Movie	Number	Fraction	Angle
Horror	36	$\frac{36}{90}$	$\frac{36}{90} \times 360 = 144°$
Action	24	$\frac{24}{90}$	$\frac{24}{90} \times 360 = 96°$
Thriller	20	$\frac{20}{90}$	$\frac{20}{90} \times 360 = 80°$
Love Story	10	$\frac{10}{90}$	$\frac{10}{90} \times 360 = 40°$
TOTAL	90	1	360°

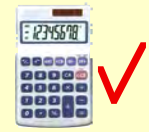


Step 1 :- add up the **Numbers** column to obtain a **total** (in this case 90).

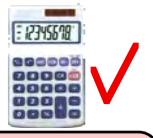
Step 2 :- express each "Number" as a **fraction** of this **total**. (e.g. $\frac{36}{90}$).

Step 3 :- find that **fraction of 360°** each time (e.g. $\frac{36}{90} \times 360 = 144°$).

Step 4 :- finally, draw the pie chart using the angles in the table and a protractor.



Exercise 3



1. **a** Copy and complete the table showing a group of 180 pupils' mode of transport to school.

   b Construct a pie chart using a pair of compasses, a ruler a protractor and the table information.

Vegetable	Number	Fraction	Angle
Walk	90	$\frac{90}{180}$	$\frac{90}{180} \times 360 = 180°$
Car	60	$\frac{60}{180}$	$\frac{60}{180} \times 360 = ...°$
Bus	20	$\frac{\quad}{180}$	$\frac{\quad}{180} \times 360 = ...°$
Train	10	$\frac{\quad}{180}$	$\frac{\quad}{180} \times 360 = ...°$
TOTAL	180	1	360°

2. **a** Copy and complete this table which shows the number of pupils choosing their favourite school holiday.

   b Construct an accurate pie chart showing this information.

Grades	Number	Fraction	Angle
Summer	3	$\frac{3}{45}$	$\frac{3}{45} \times 360 = 24°$
Christmas	21	$\frac{21}{45}$	$\frac{21}{45} \times 360 = ...°$
Easter	17	$\frac{\quad}{45}$	$\frac{\quad}{45} \times 360 = ...°$
October	4	$\frac{\quad}{45}$	$\frac{\quad}{45} \times 360 = ...°$
TOTAL	45	1	360°

3. **a** Copy and complete the table showing a group of teachers' favourite lunchtime drink.

Favourite Drink	Number	Fraction	Angle
Tea	7	$\frac{7}{30}$	$\frac{7}{30}$ x 360 = ...°
Juice	4		x 360 = ...°
Water	6		x 360 = ...°
Coffee	13		x 360 = ...°
TOTAL	30		360°

b Construct an accurate pie chart showing this information.

4. For each table below, copy it (adding new columns to show your working) and construct an accurate pie chart to show the information :-

a

Favourite PE Activity	Number
Football	32
Basketball	24
Swimming	3
Badminton	13
TOTAL	.....

b

Girls Ages	Number
4 - 6	380
7 - 9	260
10 - 12	60
13 - 15	20
TOTAL	.....

5. Pupils were asked to name their favourite radio station.

Capitol	Smooth	Radio 1	Clyde	Radio 1	Clyde	Smooth	Capitol
Clyde	Radio 1	Smooth	Clyde	Smooth	Clyde	Radio 1	Clyde
Smooth	Clyde	Real	Capitol	Smooth	Real	Clyde	Clyde
Radio 1	Smooth	Real	Clyde	Clyde	Capitol	Real	Radio 1
Smooth	Clyde	Clyde	Clyde	Smooth	Clyde	Smooth	Capitol

a Copy and complete this table :-

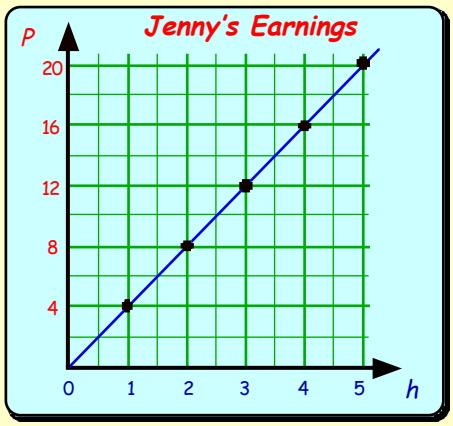
Hotel	*Tally Mark*	*Number*	*Fraction*	*Angle*
Clyde				
Capitol				
Radio 1				
Smooth				
Real				

b Using a pair of compasses, a ruler and a protractor, construct an accurate pie chart for this information.

Working with Graphs - Extrapolation And Interpolation

Jenny earns £4 per hour working part time in an office.

The graph opposite shows how much she earns for up to five hours.



Sometimes you are asked to **extend** the graph.

Example :- How much does she earn for 9 hours ?

Answer :- **£36** (4 x 9)

This process is called **extrapolation**.

You can also be asked to find a solution on your graph which is not a whole number.

Example :- How much does she earn for three and a half hours ?

Answer :- **£14** (4 x 3·5)

This process is called **interpolation**.

Exercise 4

1. The graph shown is how much Jack the joiner earns per hour.

How much does Jack earn after :-

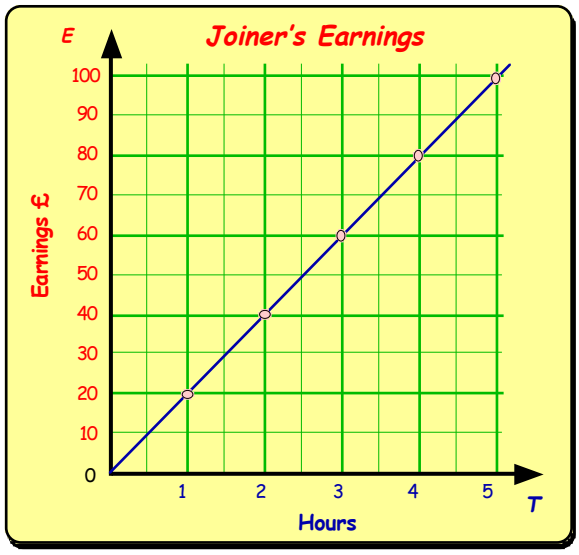
a 1 hour **b** 4 hours

c 6 hours **d** 11 hours

e 1·5 hours

f three and a half hours

g nine and a half hours ?



2. The graph shows how fast (at a constant rate of descent) a helicopter descends from 1000 m.

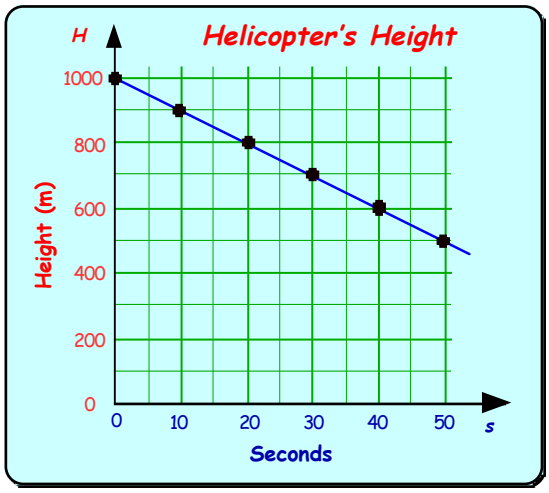
a What is the height of the helicopter after :-

(i) 10 seconds **(ii)** 30 seconds ?

b What is the approximate height after :-

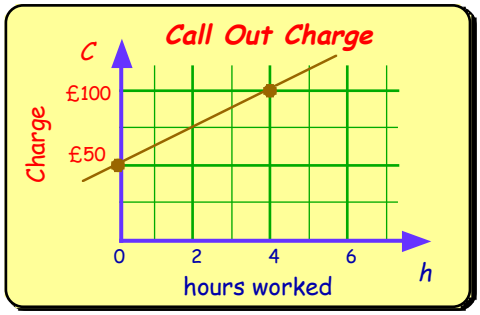
(i) 15 seconds **(ii)** 35 seconds ?

c At the same rate of descent, how many seconds will have passed for the helicopter to land ?



3. The graph shows the charges of Erin the electrician.

Erin has a call-out charge even before she starts work.



a State the call-out charge.

b How much will Erin charge for :-

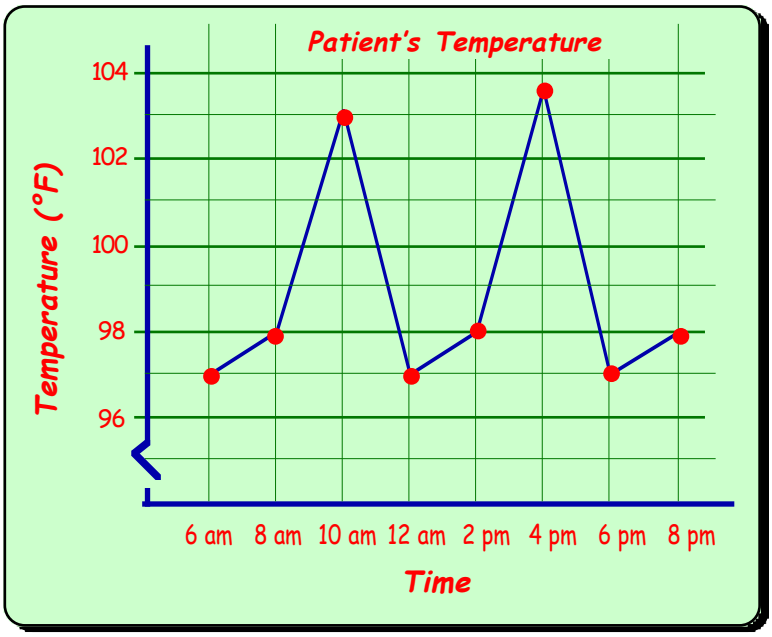
(i) 2 hours **(ii)** 4 hours work ?

c How much will Erin charge for working :-

(i) 6 hours **(ii)** 7 hours **(iii)** 1 hour **(iv)** 11 hours ?

4. The graph shows the temperature of a patient with a fever.

He is given an injection at 10 am, 4 pm and 10 pm to help reduce it.



a What was the patient's temperature at :-

(i) 10 am

(ii) noon

(iii) 8 pm ?

b Estimate his temperature at :-

(i) 1 pm

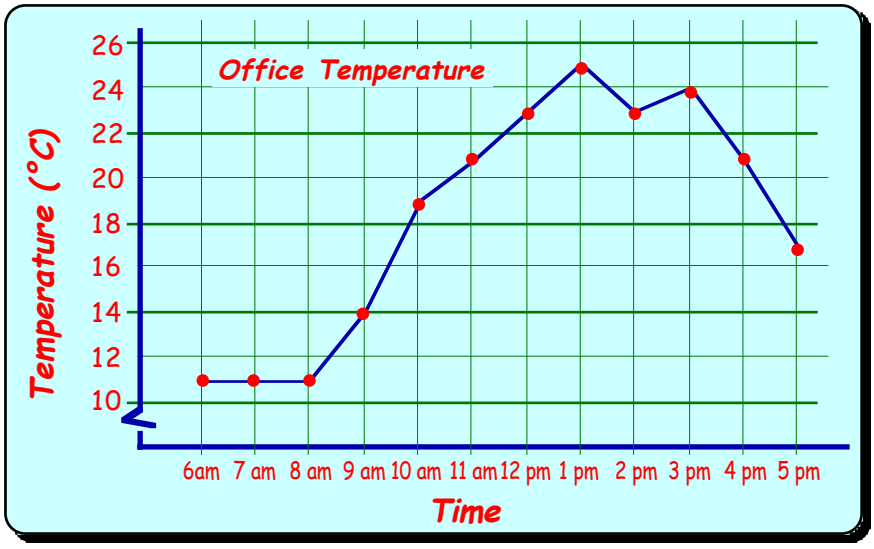
(ii) 5 pm.

c Estimate what his temperature is expected to be at :-

(i) 10 pm **(ii)** midnight.

5. An office building opens at 8 am and closes at 5 pm.

The graph shows the average temperatures on any given workday.



a Estimate the temperature at :-

(i) 10:30 am

(ii) 1:30 pm

(iii) 3:30 pm

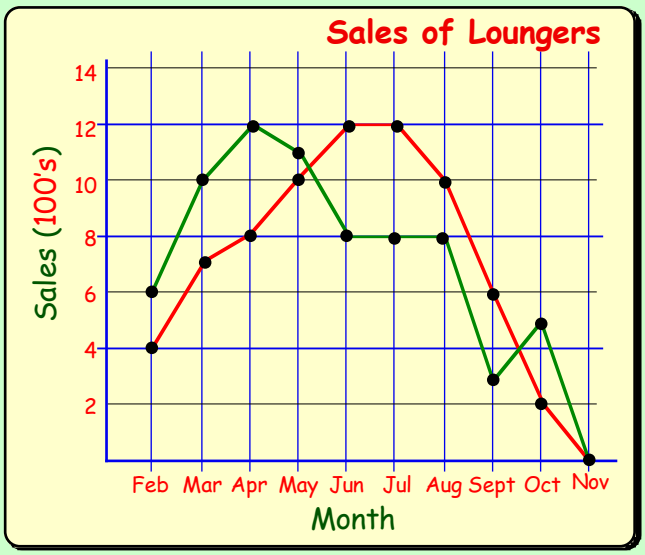
b What would be the likely temperature at :- **(i)** 6 pm **(ii)** midnight ?

What Have I Learned ?

1. Two companies sell sun loungers.

- The Sun Store (in **red**) and
- Sun Chair Company (in **green**)

The **comparative line graph** gives the sales in hundreds of units.



a State The Sun Store sales in :-

(i) April **(ii)** October.

b State the Sun Chairs Co. sales in :-

(i) March **(ii)** September.

c Whose sales were lower in :-

(i) May **(ii)** August **(iii)** November ?

Sun Store makes £50 profit and Sun Chairs makes £30 profit on each lounger.

d **(i)** Who made **more** profit in May **(ii)** How much **more** profit in May ?

2. The pie chart shows how a fitness instructor spent her time over a 2 hour period.

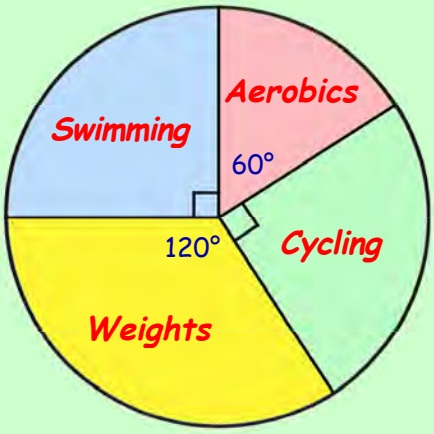
a **(i)** For what **fraction** of the period was the instructor **swimming** ?

(ii) For what fraction of the day was she doing weights ?

b For how many minutes was she :-

(i) Swimming **(ii)** Doing weights

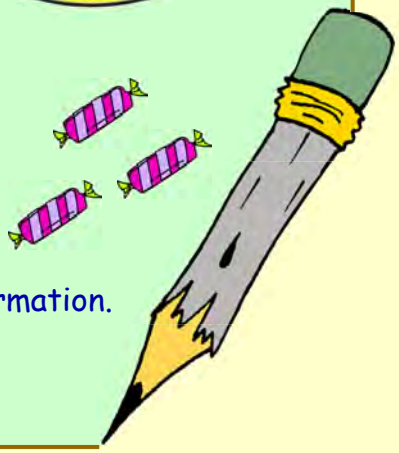
(iii) Aerobics **(iv)** Cycling ?



3. Shown below are the number of sweets in 33 bags.

41	61	21	52	42	60	53	38	58	45	59
62	84	51	24	72	49	43	72	66	31	71
50	35	80	60	35	59	24	86	30	55	46

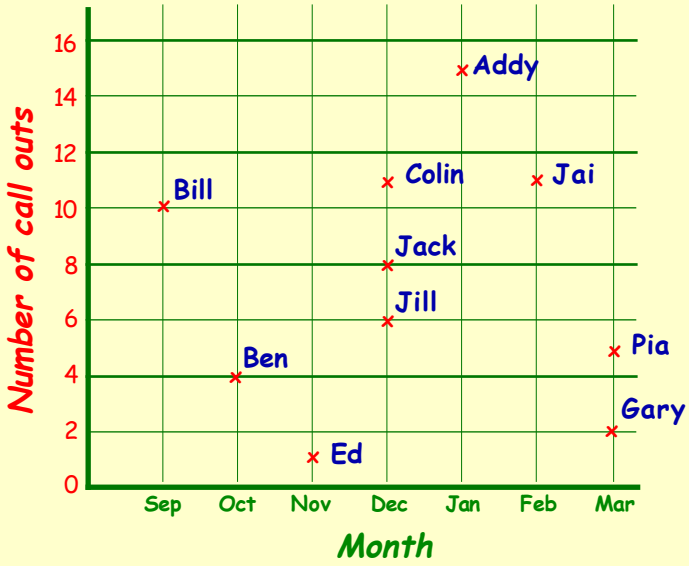
Draw an **ORDERED** stem-and-leaf diagram to show this information.



What Have I Learned ?

4. An alarm company manager decided to monitor the number of call-outs his workers had to attend to over a period of time.

The results are shown in the scattergraph.



a How many emergency call outs did Bill make in September ?

b **Two** employees made the same number of call outs.

Who were they and in which months ?

c Which employee made the most call outs and in which month ?

d The manager noticed that the best month was November. Explain.

5. The Warriors, a local football team, recorded how many goals they scored each month over the last ten months.

Their monthly total scores were :-

16	16	3	16	4	4	13	1	19	8

a Find the **mean**, **median**, **mode** and **range** of their scores.

A rival team, the All-Stars, recorded their scores as :-

17	11	30	7	8	2	12	10	9	4

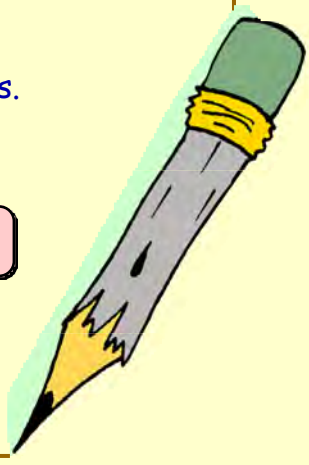
b Use the **mean** and **range** to compare both sets of scores.

6. A company director examines his garage profits from 6 car showrooms.

The profits were recorded as follows :-

£80 000, £110 000, £75 000, £75 000, £125 000, £260 000.

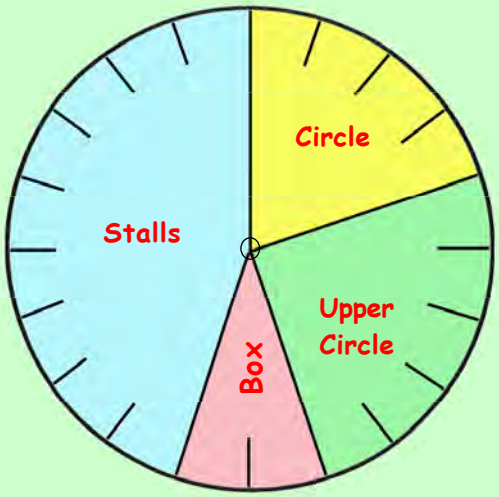
Calculate the mean, mode and median and decide which average he should use. (*Explain why you think he should use this one*).



What Have I Learned ?

7. This pie chart, showing the sale of tickets for a show, has been divided into **20 equal parts**.

Ticket Sales



a What percentage does each part stand for ?

b What percentage represents :-

(i) Stalls **(ii)** Circle

(iii) Upper Circle **(iv)** Box seats ?

800 tickets were sold for the show.

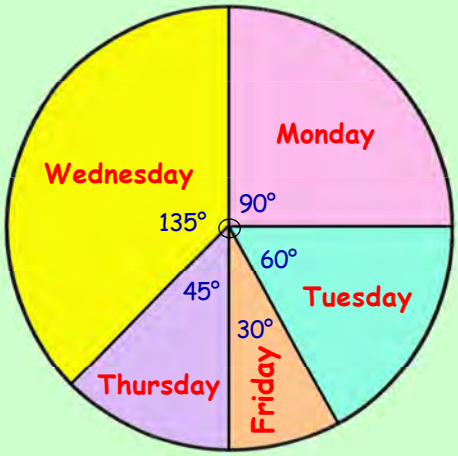
c **How many** of the tickets sold were for :-

(i) Stalls **(ii)** Circle

(iii) Upper Circle **(iv)** Box Seats ?

8. Two hundred and forty S1 pupils were asked what was their favourite school day.

Favourite S1 Schoolday



a What fraction of them voted for Monday ?

b What fraction of them voted for :-

(i) Tuesday **(ii)** Wednesday

(iii) Thursday **(iv)** Friday ?

c How many voted for :-

(i) Monday **(ii)** Tuesday

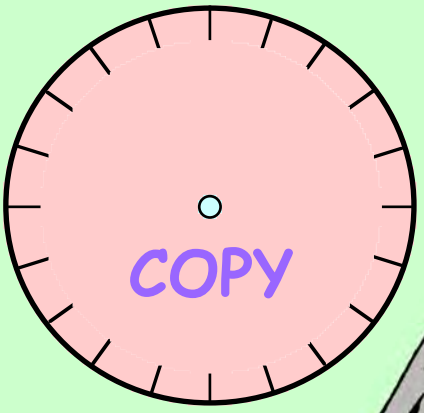
(iii) Wednesday **(iv)** Thursday ?

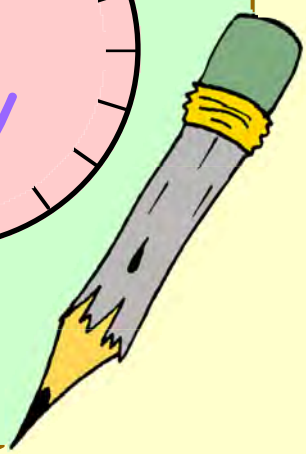
9. A large group of people were asked to name their favourite news channel.

Here are the results :-

- 35% STV
- 30% BBC1
- 20% Channel 5
- the rest chose Sky News.

Copy (or trace) the blank pie chart and complete it showing the above information.





What Have I Learned ?

10. The table shows the results of a survey asking a group of S1 pupils their favourite lunchtime drink.

Irn Bru	Orange	Cola	Water	Cola	Water	Orange	Irn Bru
Water	Cola	Orange	Water	Orange	Water	Cola	Water
Orange	Water	Lemonade	Irn Bru	Orange	Lemonade	Water	Water
Cola	Orange	Lemonade	Water	Water	Irn Bru	Lemonade	Cola
Orange	Water	Water	Water	Orange	Water	Orange	Irn Bru

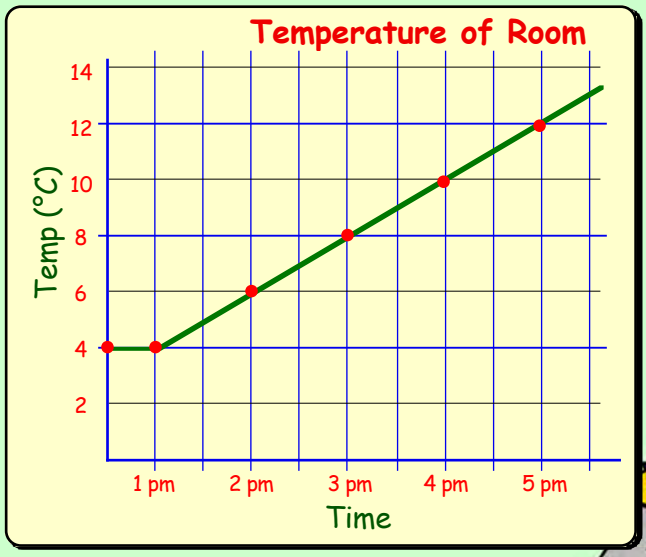
a Copy and complete the table :-

Hotel	*Tally Mark*	*Number*	*Fraction*	*Angle*
Water				
Irn Bru				
Cola				
Orange				
Lemonade				

b Using a pair of compasses, a ruler and a protractor, construct an accurate pie chart for this information.

11. A radiator is turned on in a room at 1 pm.

The temperature of the room is raised at a constant rate.



a What was the temperature at :-

(i) 2 pm **(ii)** 4 pm

(iii) 5 pm **(iv)** 1 pm ?

b Estimate the temperature at :-

(i) 6 pm **(ii)** 7 pm

(iii) 9 pm **(iv)** midnight ?

c Estimate the temperature at :-

(i) 1.30 pm **(ii)** 3.30 pm **(iii)** 5.15 pm **(iv)** 8.15 pm.

d What do you think the temperature was at noon ?
(An hour **before** the radiator was turned on).

CHAPTER 25

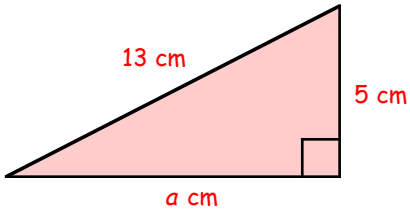
Pythagoras Theorem 2

Finding the Length of a Smaller Side

note

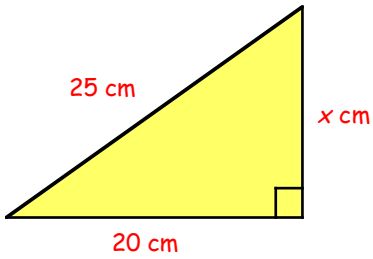
note

$$a^2 = c^2 - b^2$$
$$\Rightarrow \quad a^2 = 13^2 - 5^2$$
$$\Rightarrow \quad a^2 = 169 - 25 = 144$$
$$\Rightarrow \quad a = \sqrt{144} = \mathbf{12\ cm}$$



Exercise 1 (*Give all answers to 3 significant figures where appropriate*).

1. Calculate the length of the **smaller** side.



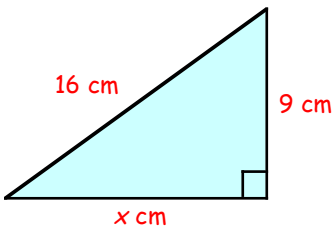
Copy and complete :-

Can you see why ?

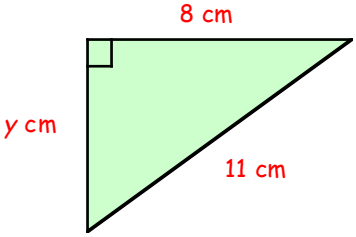
$$x^2 = 25^2 - 20^2$$
$$\Rightarrow \quad x^2 = 625 - 400$$
$$\Rightarrow \quad x^2 = \ldots\ldots$$
$$\Rightarrow \quad x = \sqrt{\ldots\ldots}$$
$$\Rightarrow \quad x = \ldots\ldots\ \mathbf{cm}$$

2. Calculate the length of a **smaller** side each time here :-

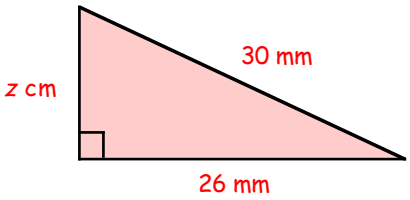
a



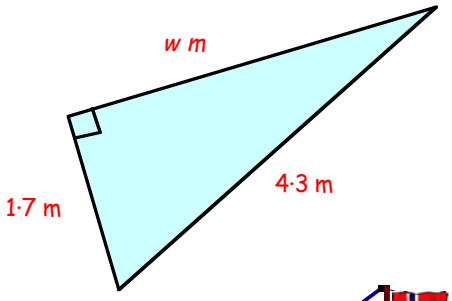
b



c



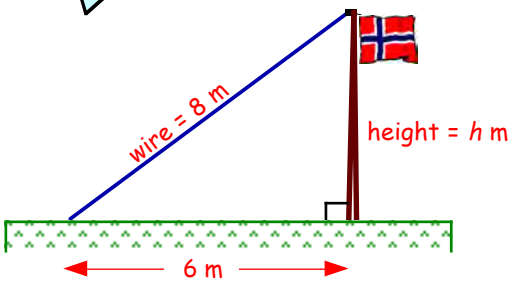
d



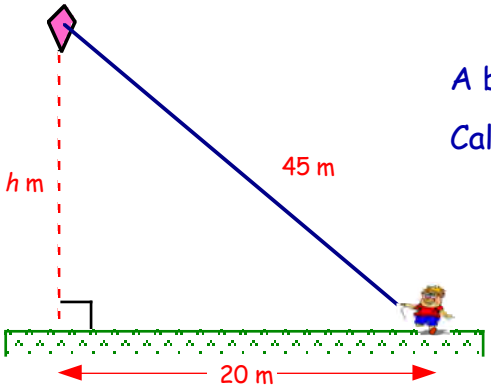
3. An 8 metre wire is used to support a flagpole.

The wire is fixed to a point 6 metres from the base of the pole.

Calculate the **height** of the pole.



4.



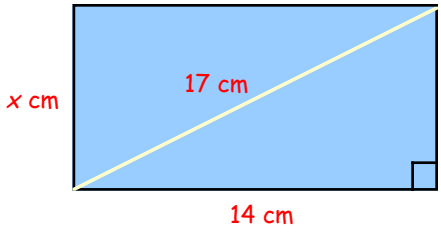
A boy is flying his kite at the end of a 45 metre wire.

Calculate the height of the kite above the ground.

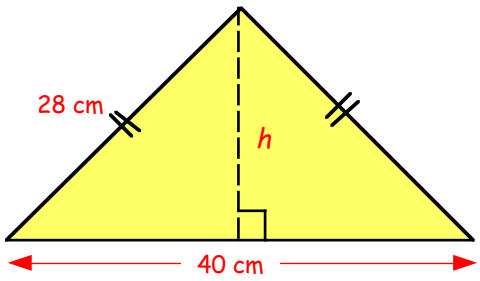
5. The diagonal of a rectangle is 17 centimetres long.

The larger side is 14 centimetres.

Calculate the length of the shorter side.



6.



The base of an **isosceles** triangle is 40 cm long.

The length of each of the sloping sides is 28 centimetres.

Calculate the **height** of the triangle.

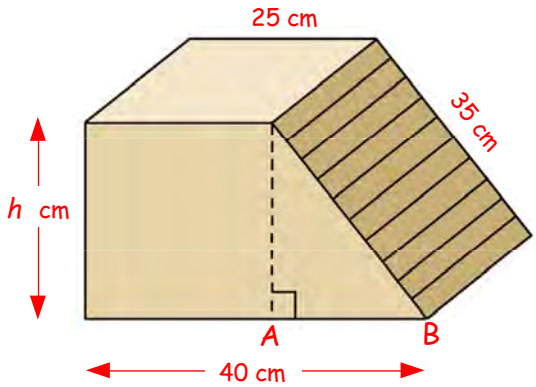
7. This is the side view of a pine bread box.

The base is 40 cm wide and the top is 15 cm wide.

The sloping edge is 35 cm long.

a Write down the length from A to B.

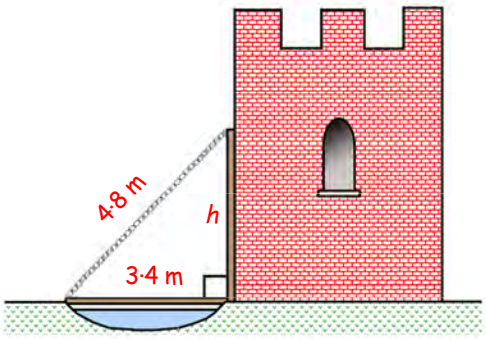
b Calculate the height of the bread box.



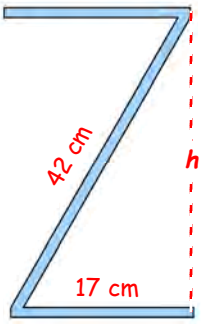
8. The drawbridge of a castle is 3·4 metres wide.

The chain is 4·8 metres long.

Calculate the height of the entrance to the castle.



9.



This letter Z appears on a sign above a shop.

Calculate the height of the letter Z.

The Distance between 2 Points (Coordinates)

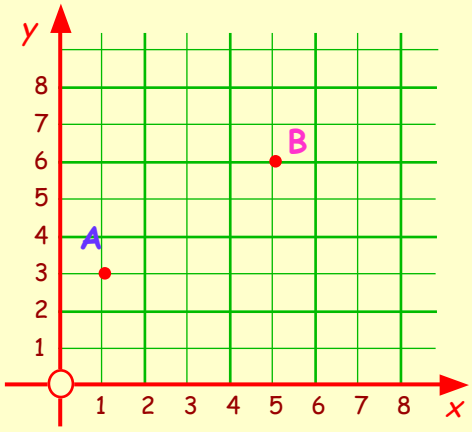
Reminder – Look at the coordinate diagram.

The 2 main lines are called **axes**.

The horizontal one is the ***x*-axis**.

The vertical one is the ***y*-axis**.

The point where they meet is the **origin**.



Can you see that the point marked **A**

is **1** – to the right of the origin

and **3** – up from the origin ? => **A(1, 3)**

x coordinate

y coordinate

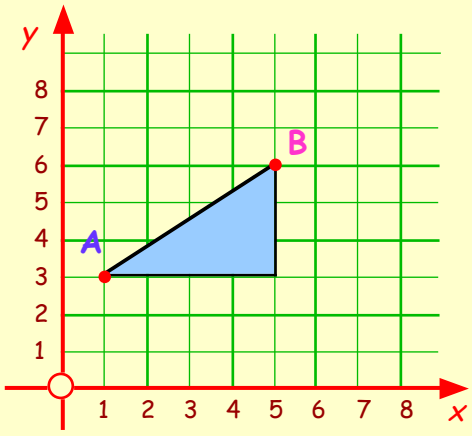
Can you see that **B** is the point **B(5, 6)** ?

along

up

To calculate the length of the sloping side AB, we make up a **right angled triangle** by drawing a "horizontal line" through A and a "vertical line" drawn from B.

The triangle is 4 boxes long and 3 boxes high.



(Use Pythagaras' Theorem).

$(AB)^2 = 4^2 + 3^2$

$\Rightarrow (AB)^2 = 16 + 9 = 25$

$\Rightarrow AB = \sqrt{25}$

$\Rightarrow AB = 5$ units

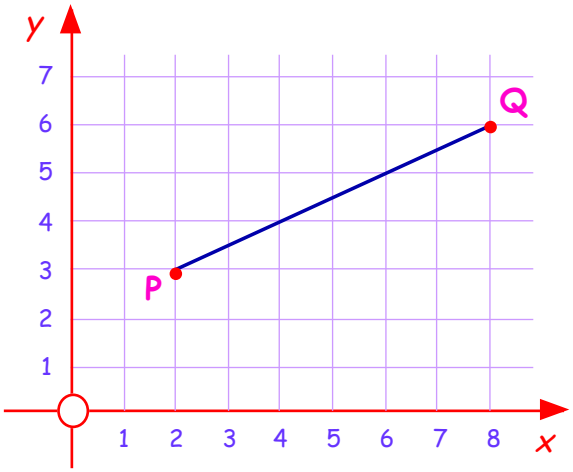
Exercise 2

1. **a** Write down the coordinates of the points P and Q.

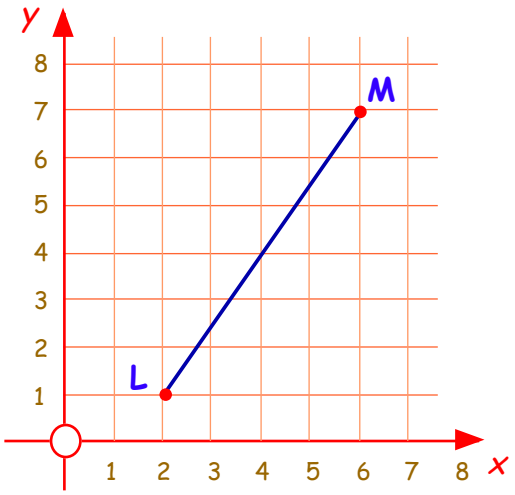
b **Copy** the figure accurately showing the 2 points.

c Join P to Q and make a right angled triangle similar to the one in the example shown.

d Use Pythagoras' Theorem to calculate the length of the line PQ.



2.



a What are the coordinates of the two points, L and M in this figure ?

b Copy the figure accurately showing the two points, L and M.

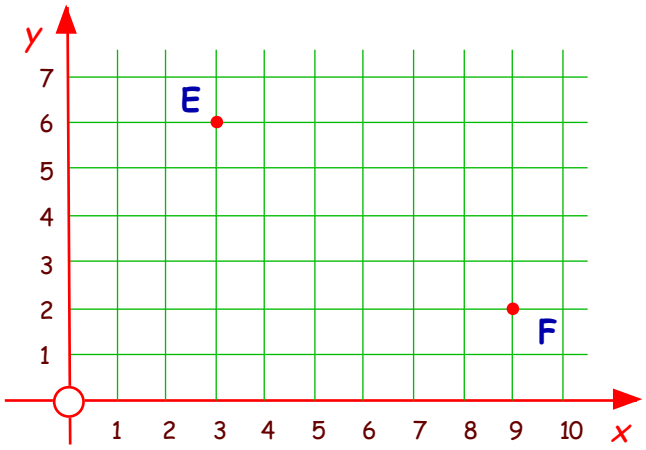
c Join L to M and make a right angled triangle.

d Calculate the length of the line LM.

3. **a** Write down the coordinates of the points E and F.

b Copy the figure accurately showing the two points, E and F.

c Join E to F, complete the right angled triangle and calculate the length of the line EF.



4. **a** Draw your own coordinate diagram measuring 7 boxes across by 6 boxes upwards.

b Mark on it the *x*-axis, the *y*-axis and the origin.

c Plot the two points, S(1, 2) and T(7, 5).

d Create a right angled triangle and calculate the length of the line ST.

5. **a** Draw a new set of axes, 8 boxes by 8 boxes, and label the x-axis and y-axis.

b Plot the 2 points, W(1, 8) and V(7, 2).

c Calculate the length of the line WV.

6. **Harder !!**

a Draw a final set of axes, 10 along by 6 up.

b Plot the 2 points, G(2, 1) and H(6, 4) and calculate the length of the line GH.

c On the same diagram, plot the point J(10, 1).

d Now calculate the length of the line HJ.

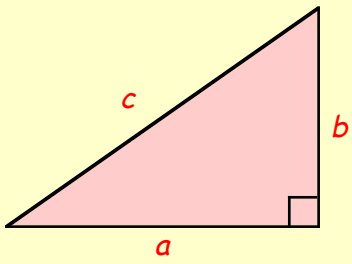
e By comparing the 2 sides GH and HJ, say what kind of triangle GHJ must be.

Mixed Examples

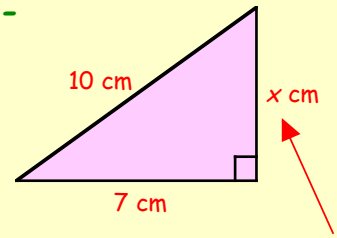
In the following exercise you will be asked to find :-

- the **hypotenuse** (use $c^2 = a^2 + b^2$)
- a **smaller side** (use $a^2 = c^2 - b^2$)

**** You must decide which formula you have to use.***



Example 1 :-



(Here you are looking for a **short side**).

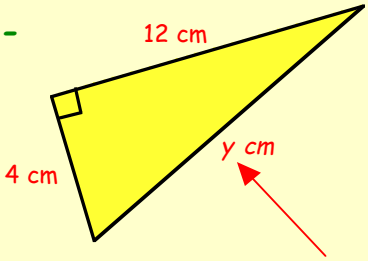
$x^2 = 10^2 - 7^2$

$\Rightarrow x^2 = 100 - 49$

$\Rightarrow x^2 = 51$

$\Rightarrow x = \sqrt{51} = 7{\cdot}14$ **cm**

Example 2 :-



(Here you are looking for the **hypotenuse**).

$x^2 = 12^2 + 4^2$

$\Rightarrow x^2 = 144 + 16$

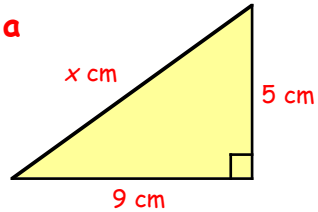
$\Rightarrow x^2 = 160$

$\Rightarrow x = \sqrt{160} = 12{\cdot}6$ **cm**

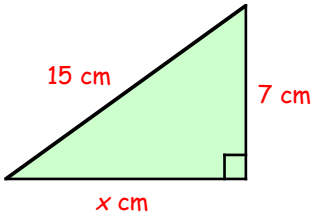
Exercise 3

1. Decide whether to use $c^2 = a^2 + b^2$ or $a^2 = c^2 - b^2$ here and calculate x :-

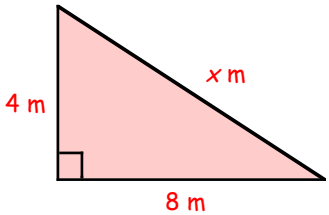
a



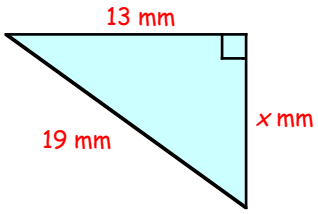
b



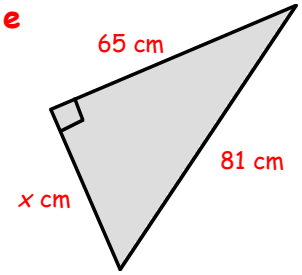
c



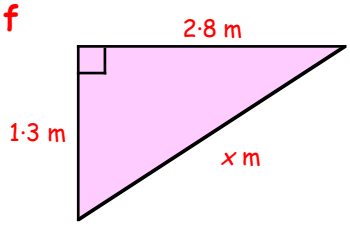
1. **d**



e



f



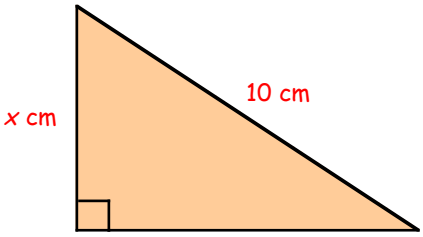
2. When David was asked to calculate the value of x, he proceeded as follows :-

$x^2 = 10^2 + 7^2$

$\Rightarrow \quad x^2 = 100 + 49$

$\Rightarrow \quad x^2 = 149$

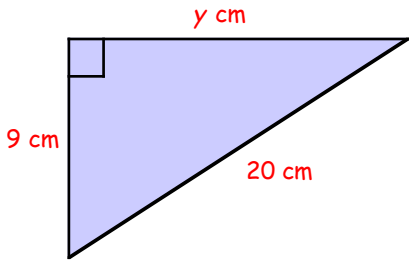
$\Rightarrow \quad x = \sqrt{149} = 12 \cdot 2$ **cm**



Explain in words, when David looked at his answer and at the triangle, why he should have known immediately that his answer **had** to be **wrong**.

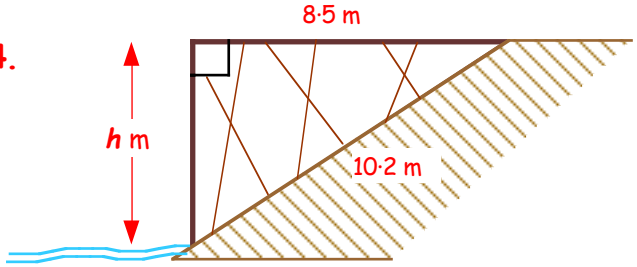
3. One of the following two answers is known to be the **correct** value for y.

$y = 17 \cdot 9$ cm or $y = 21 \cdot 9$ cm



Without actually doing the calculation, say which answer must be correct and why the other is obviously wrong.

4.



A wooden pier is shown in this diagram.

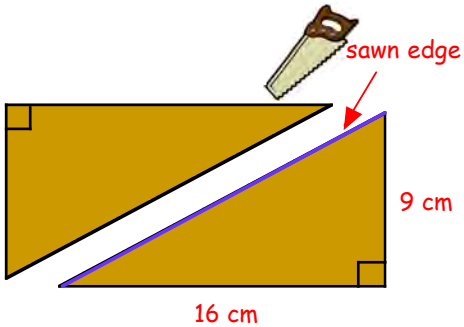
It is in the shape of a right angled triangle.

Calculate the height ***h*** of the pier.

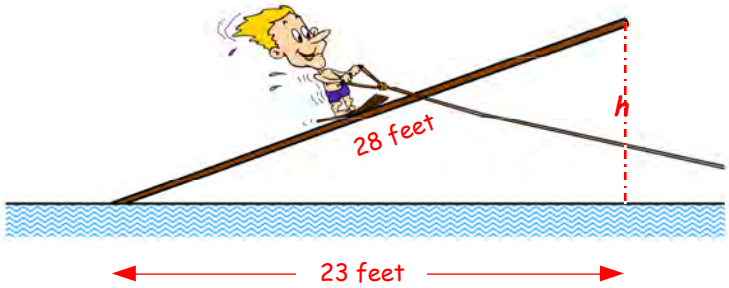
(*Is it* $h^2 = 10 \cdot 2^2 + 8 \cdot 5^2$ *or* $h^2 = 10 \cdot 2^2 - 8 \cdot 5^2$)?

5. To make two triangular shelf bracket supports, Tom saws "diagonally" across a rectangular piece of wood.

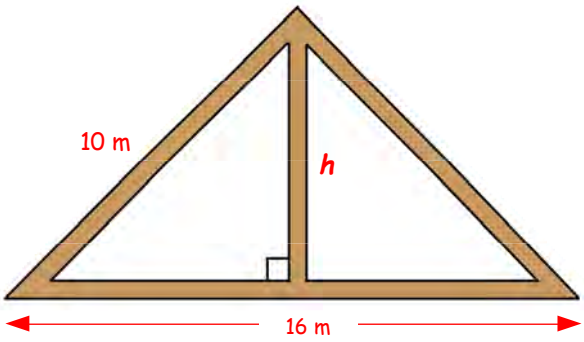
Calculate the length of the sawn edge.



6. Use the measurements shown in the diagram to calculate the height ***h*** of the ski jump.



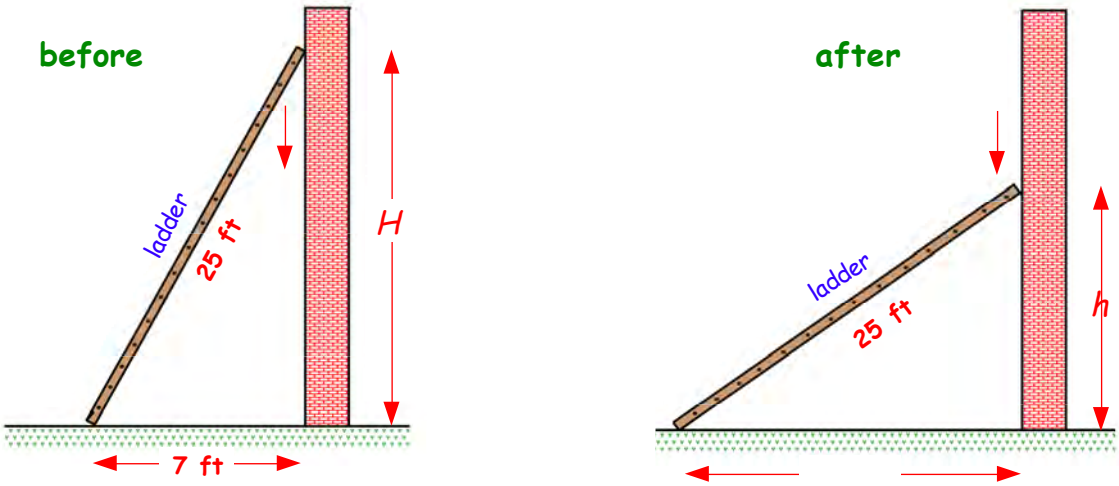
7.



The figure shows a wooden roof support in the shape of an **isosceles** triangle.

Calculate the height ***h*** of the triangle.

8. A ladder slid "partially" down a wall as shown in the two diagrams below.



a Calculate the original height ***H*** of the top of the ladder.

b Calculate the new height ***h*** of the top of the ladder.

c By how many feet had the top of the ladder slipped ?

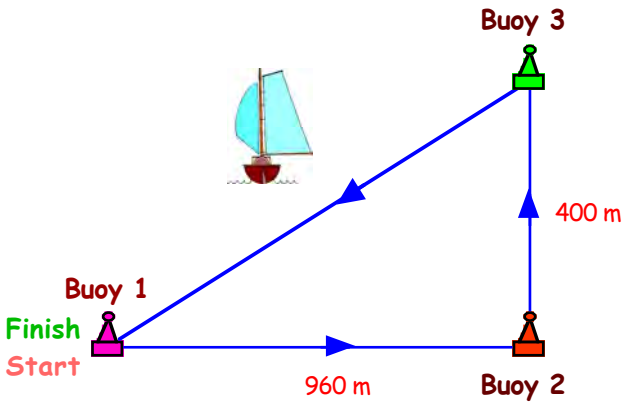
9. A yacht sailed around a course in the shape of a right angled triangle.

It sails East from Buoy 1 to Buoy 2.

It then sails North to Buoy 3.

It finally sails back to the first Buoy.

Calculate the total distance travelled by the yacht along its triangular path.

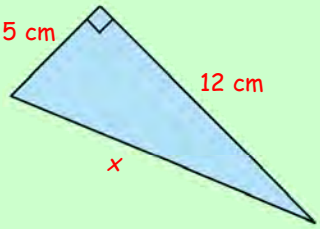


What Have I Learned ?

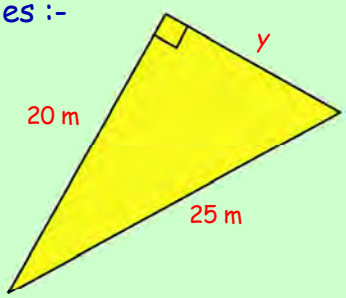
Give your answers to 1 decimal place when required.

1. Calculate the length of the third side in these triangles :-

a

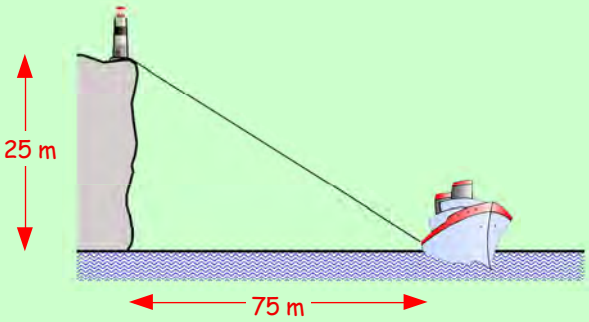


b

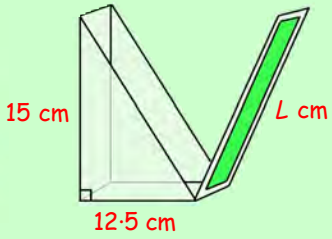


2. A rope is stretched between a boat and the top of a cliff to transport supplies from the boat to a light-house keeper living on top of the cliff.

Calculate the length of rope required.



3.



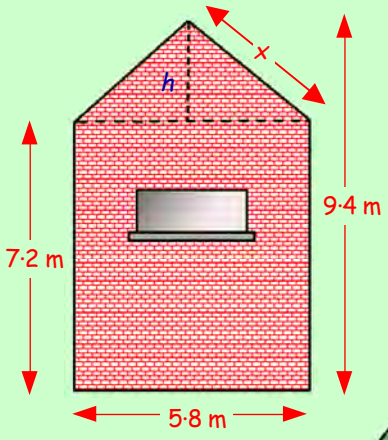
Shown is a clear plastic sandwich holder.

Calculate the length of the sloping flap (*L* cm).

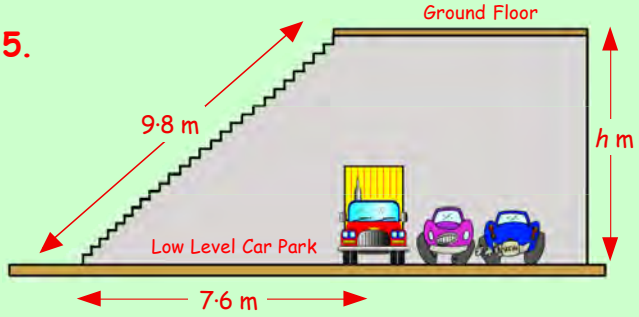
4. Shown is the side view of a building, 9·4 metres high and 5·8 metres wide.

a Write down the height *h* metres of the attic.

b Calculate the length *x* metres of the sloping roof.

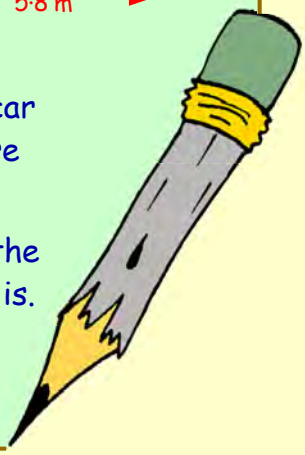


5.



Stairs join the low level car park of a department store to its ground floor.

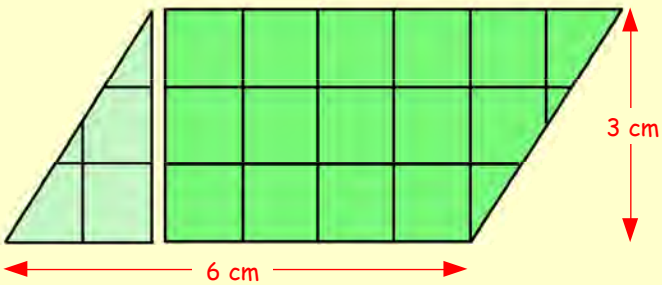
Work out how high above the car park the ground floor is.

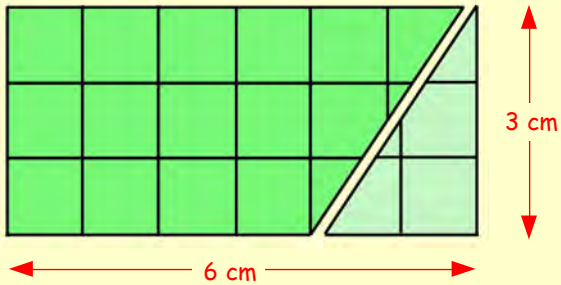


CHAPTER 26

Area of a Parallelogram

This parallelogram has base length 6 centimetres and height 3 centimetres.





By cutting off the right angled triangle on the left and moving it round to the right, we can change the parallelogram into a rectangle measuring 6 cm long and 3 cm high.

Since the area of a rectangle is :- $A = 6 \times 3 = 18\ cm^2$,

=> The area of the **parallelogram** is also given by

Area = base x height = 6 x 3 = **18 cm²**.

Rule for finding **area** of **parallelogram** is :- Area = base x height

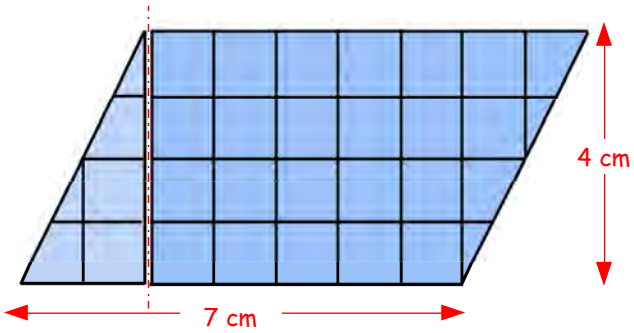
Exercise 1

1. **a** Trace this parallelogram (including the centimetre squares inside it) **neatly** using a ruler.

b On your tracing paper, cut along the dotted line.

c Stick the larger piece in your jotter.

Now, glue the small triangle onto the right to create a rectangle.

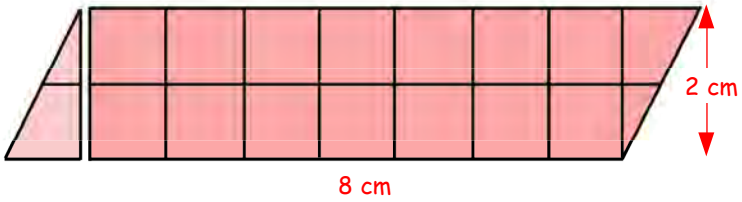


d What is the length and breadth of the rectangle ?

e Calculate the **area** of the rectangle. (*A = length x breadth*).

f Now calculate the **area** of the original parallelogram.

2. **a** Use the formula :- ***Area = b x h*** to calculate the area of this parallelogram measuring 8 cm long and 2 cm high.



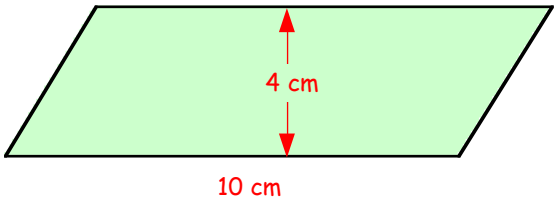
b You could now **trace** the shape, cut the left hand triangle and move it to the right to form a rectangle.

c Calculate the area of the rectangle and check that it is the same area as that of the parallelogram.

3. This is a sketch of a parallelogram.

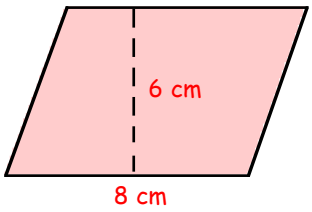
Use the formula ***A = b x h***

to calculate its area. (*in cm²*).

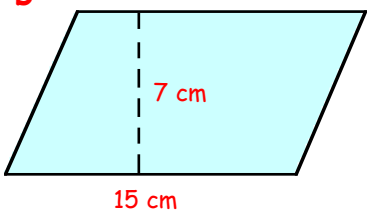


4. Make a small neat sketch of each parallelogram here and calculate their areas :-
(*Does **not** have to be full size*).

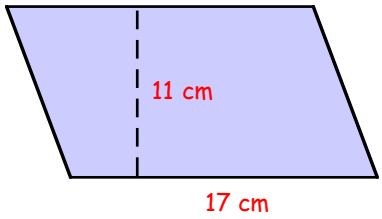
a



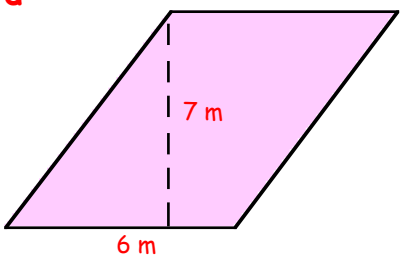
b



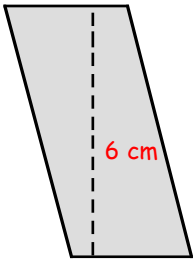
c



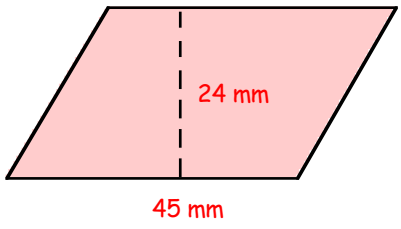
d



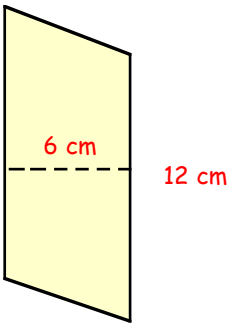
e



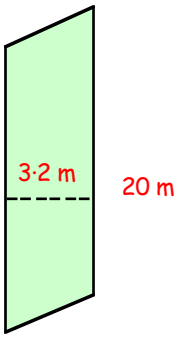
f



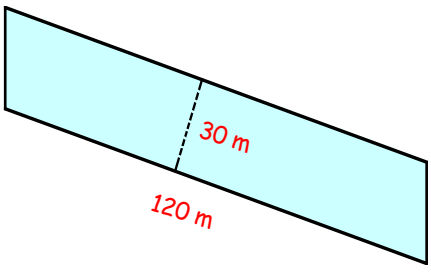
g



h

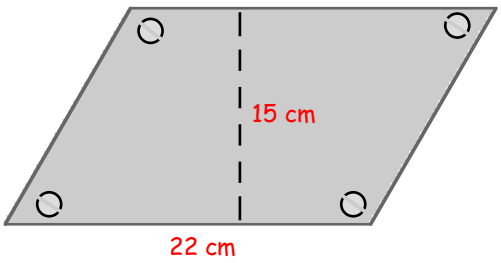


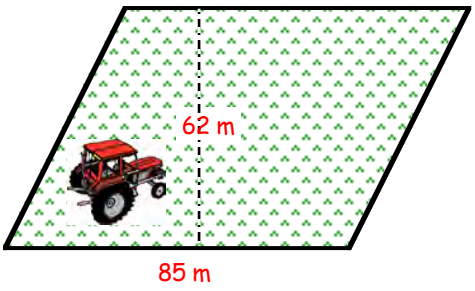
i



5. This metal support bracket is in the shape of a parallelogram.

Calculate the area of metal sheet needed to make it.

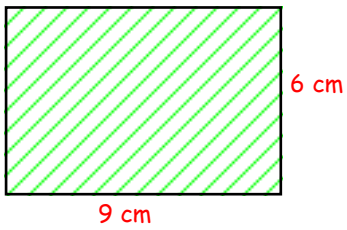


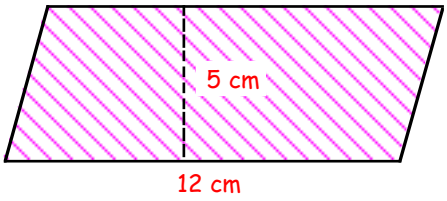
6. 

Farmer Thomson's field is in the shape of a parallelogram.

Calculate its **area** (in m^2).

7. **a** Which has the bigger area, the rectangle or the parallelogram ?

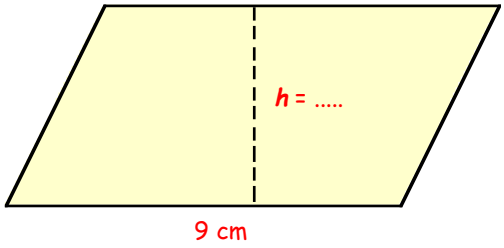




b By how much ?

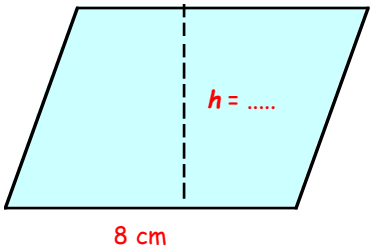
8. **Harder !** The **area** of this parallelogram is 45 cm^2.

Calculate what its height must be.



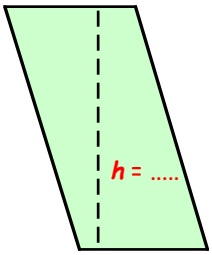
9. Calculate the heights of these 3 parallelograms :-

a



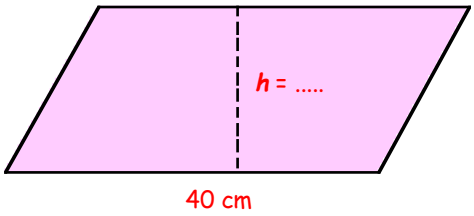
(Area = 48 cm^2)

b



(Area = 50 cm^2)

c



(Area = 520 cm^2)

10. Shown is a section of tiling on a bathroom wall.

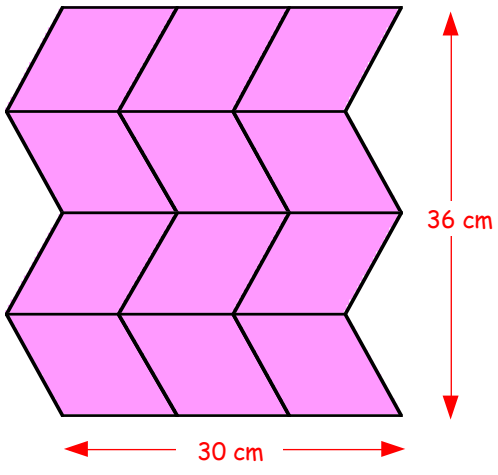
Parallelogram shaped tiles were used.

a Calculate the **length** of each tile.

b Calculate the **height** of each tile.

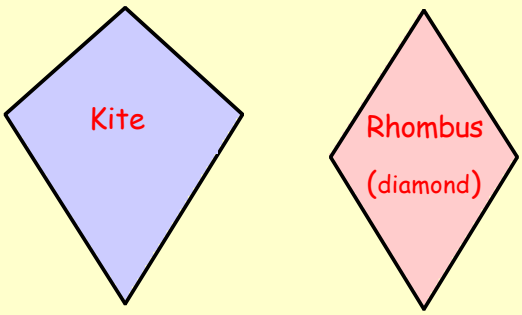
c Calculate the **area** of each tile.

d Calculate the **TOTAL AREA** of the tiles shown.



Area of a Kite and a Rhombus

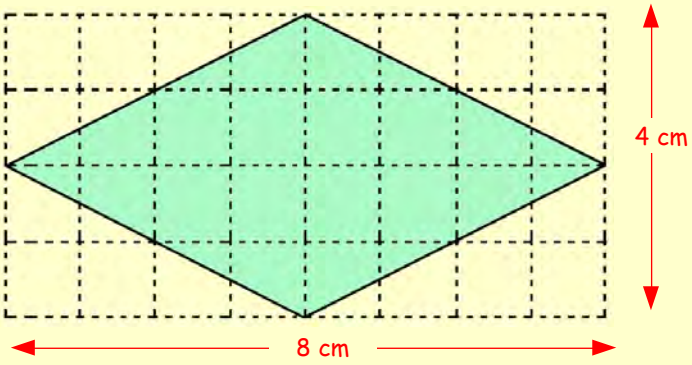
Remember what a **Kite** and a **Rhombus** looks like ?



It is fairly simple to find the **area** of a rhombus (or kite) by drawing (or imagining) the rectangle surrounding it.

This rhombus measures
8 centimetres long by
4 centimetres high.

We have drawn a (dotted) rectangle around it.



Can you see => Area of (surrounding) rectangle = $l \times b = 8 \times 4 = 32$ cm^2 ?

Can you also see => Area of rhombus = $\frac{1}{2}$ of this area = $\frac{1}{2}$ of 32 = **16 cm^2** ?

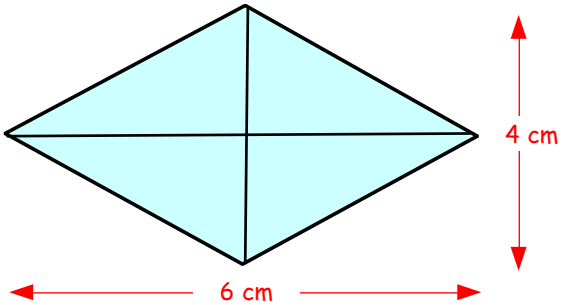
=> To find the **area** of a **rhombus** :-

find the area of the surrounding rectangle then find HALF of this answer.

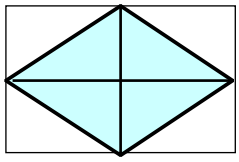
Exercise 2

1. **a** Make an accurate drawing of this rhombus, 6 cm by 4 cm.

(*You are probably better drawing the two diagonals 6 cm by 4 cm meeting at right angles in the middle first*).



b On your diagram, draw a rectangle round the rhombus.



c Calculate the **area** of the rectangle.

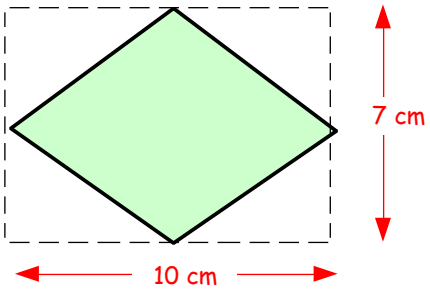
d Now calculate the area of the **rhombus** (÷ 2).

2. **a** Make a small neat ***sketch*** of this rhombus.

b Draw in the (dotted) surrounding rectangle.

c Calculate the area of the rectangle.

d Now calculate the area of the rhombus.



3. For each rhombus below :-

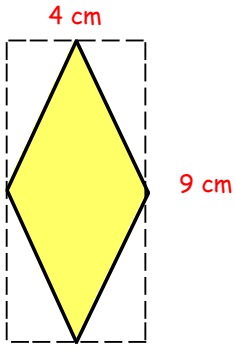
(i) Sketch the rhombus.

(ii) Surround it with a rectangle.

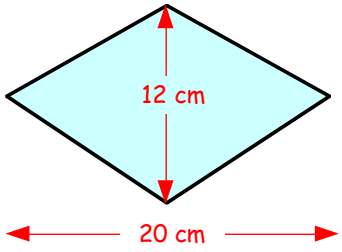
(iii) Calculate the area of the rectangle.

(iv) Finally, calculate the area of the rhombus.

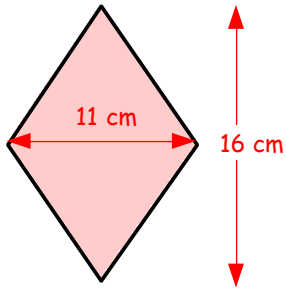
a



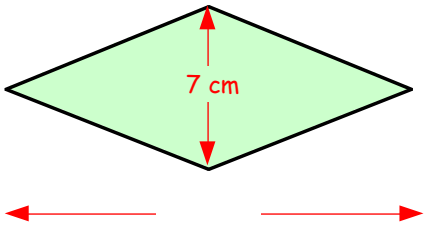
b



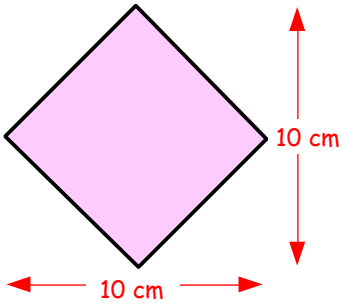
c



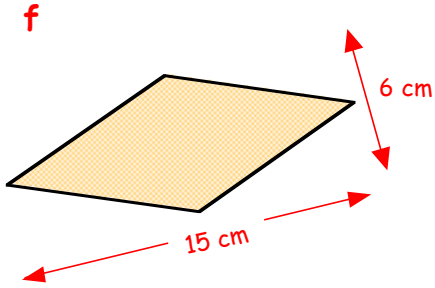
d



e



f



The **Area of a kite** is found in the same way.

Can you see that :-

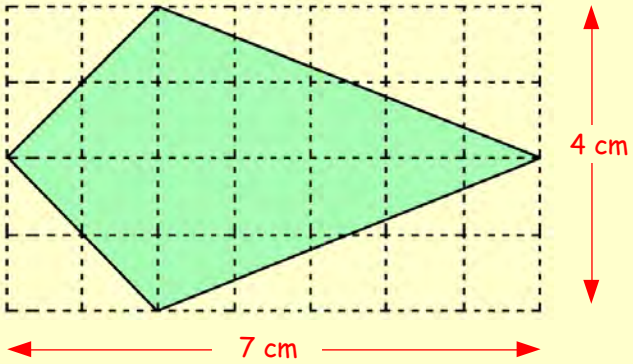
Area (rectangle) = $l \times b$ = 7 x 4 = 28 cm^2 ?

Can you also see that :-

=> **Area** (kite) = $\frac{1}{2}$ of rectangle

= $\frac{1}{2}$ of 28

= **14 cm^2** ?



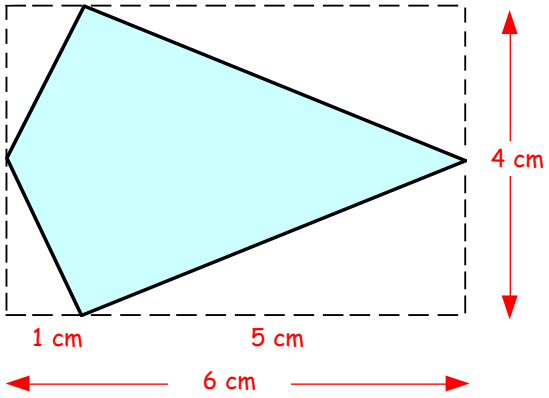
=> To find the **area** of a **kite** :-

find the area of the surrounding rectangle then find HALF of this answer.

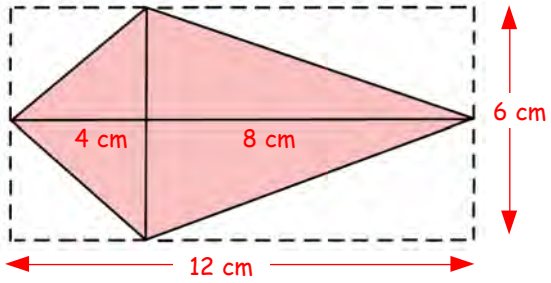
4. **a** Make an accurate drawing of this kite, using a ruler.

b Calculate the area of the surrounding rectangle.

c Now calculate the area of the **kite** (÷ 2).



5.



a Make a small neat sketch of this kite.

b Calculate the area of the surrounding rectangle.

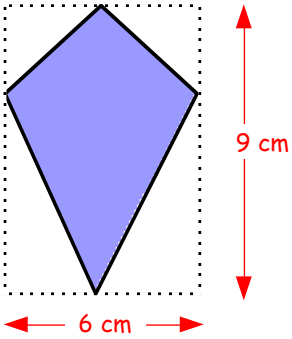
c Now calculate the area of the kite.

6. For each kite :-

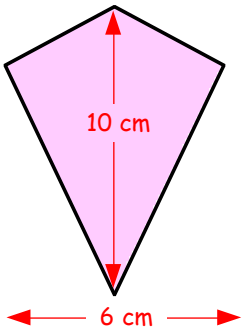
(i) Sketch the kite. **(ii)** Surround the kite with a rectangle.

(iii) Calculate the area of the rectangle. **(iv)** Now, calculate the area of the kite.

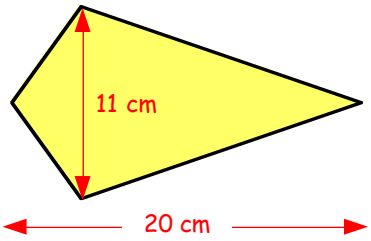
a



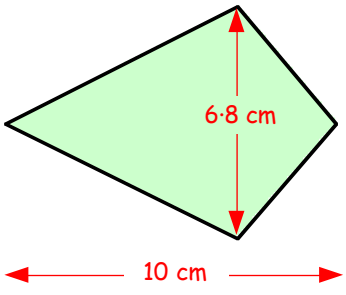
b



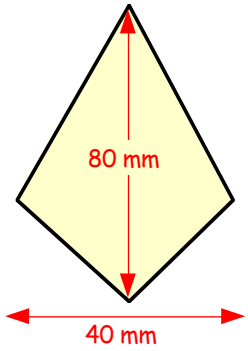
c



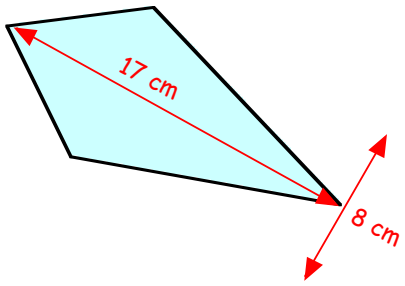
d



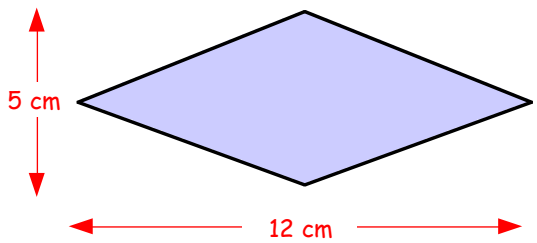
e

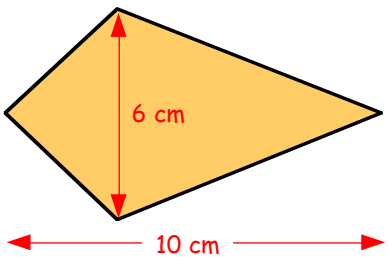


f



7. Which has the bigger area :- the rhombus or the kite, and by how much ?



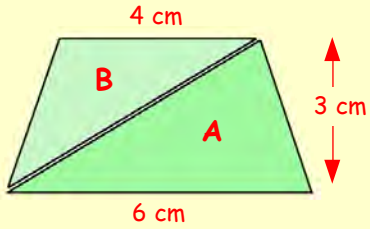


Area of a Trapezium

A **trapezium** is a quadrilateral (4 sided figure) with 2 of its sides parallel.

To calculate the **area** of a trapezium, you simply :-

- Draw in one of its diagonal lines. (*to split it into 2 triangles*).
- Calculate the area of each triangle (**A** and **B**).
- Add them together.



Area of $\Delta A = \frac{1}{2} b \times h = \frac{1}{2}$ of $(6 \times 3) = 9$ cm^2

Area of $\Delta B = \frac{1}{2} b \times h = \frac{1}{2}$ of $(4 \times 3) = 6$ cm^2

Total Area = 9 cm^2 + 6 cm^2 = **15 cm^2**

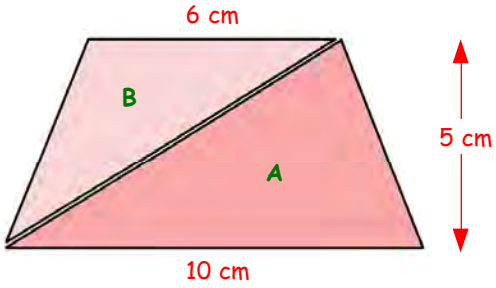
Exercise 3

1. **a** Make a neat sketch of this trapezium. (*It does not need to be accurate*).

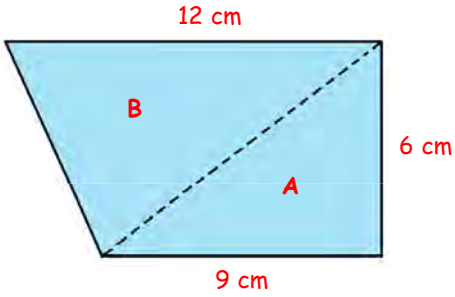
b Draw in the diagonal line (dotted).

c Calculate the area of ΔA and ΔB.

d Calculate the overall area of the trapezium.



2.

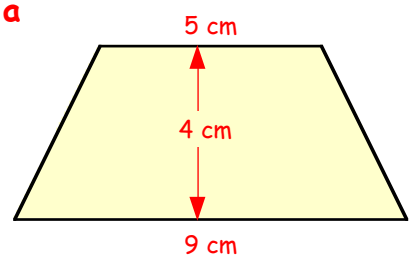


Repeat for this trapezium.

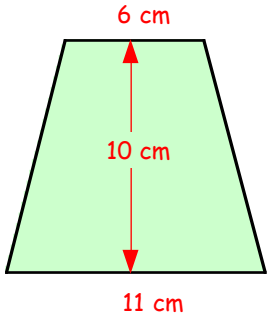
(*You may prefer to draw it the other way around with the 12 cm side on the bottom*).

3. For each of the following, sketch and split each one into 2 triangles, then calculate the area.

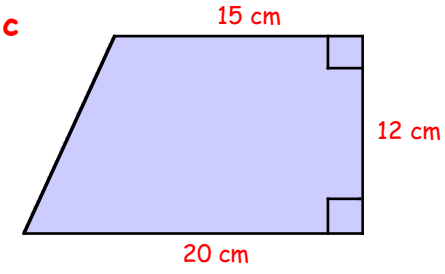
a



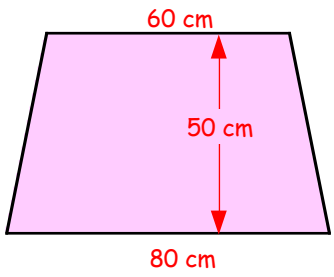
b



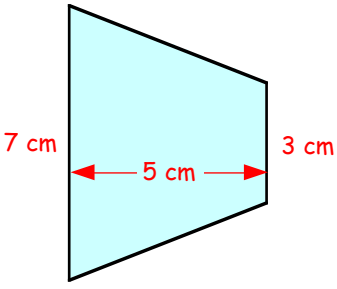
c



d

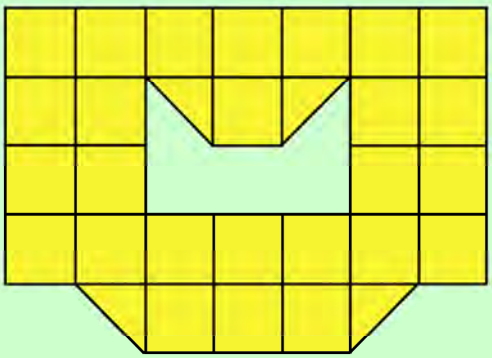


e



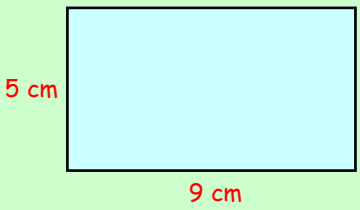
What Have I Learned ?

1. Write down the area of the yellow part of this shape.
(*Each square = 1 cm²*).

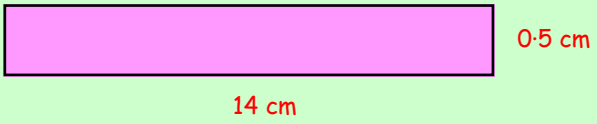


2. Calculate the areas of these rectangles :-
(*Show your working*).

a

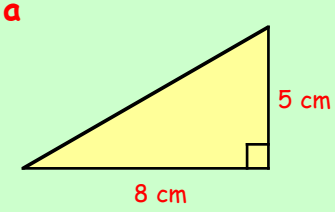


b

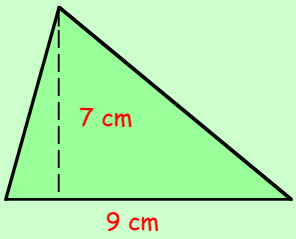


3. Calculate the areas of these shapes (*Show your working.*) :-

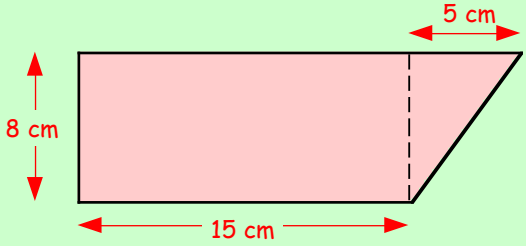
a



b

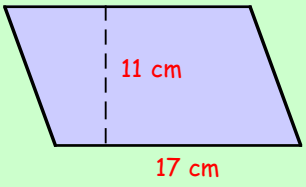


c

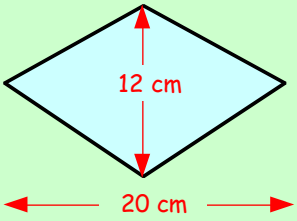


4. Calculate the area of each shape below (*Show your working.*) :-

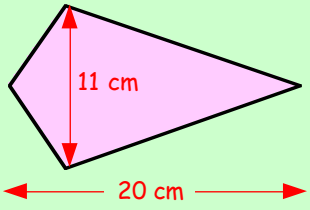
a



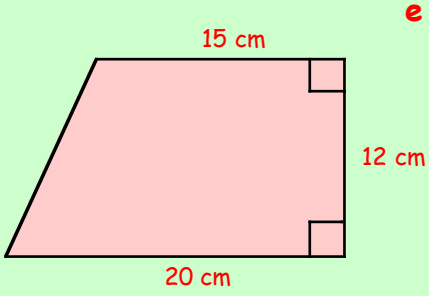
b



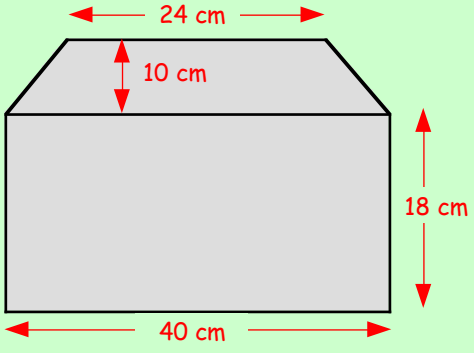
c



d



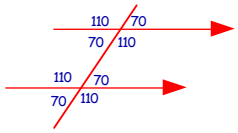
e



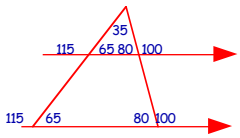
answers to National N4-1

Answers to Chapter 0 - Revision

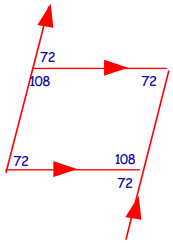
1. Learn tables
2. (a) 1001 (b) 10732 (c) 6748 (d) 7782
   (e) 1519 (f) 6456 (g) 20508 (h) 12858
   (i) 1603 (j) 339 (k) 67 (l) 438
3. (a) 64 (b) 100 (c) 400
4. (a) 170 (b) 230 (c) 1160 (d) 3700
   (e) 21300 (f) 15000 (g) 365000 (h) 289
   (i) 570 (j) 38 (k) 2150 (l) 265
5. (a) 360 (b) 1290 (c) 1440 (d) 3450
   (e) 2790 (f) 10650 (g) 10170 (h) 42210
   (i) 16200 (j) 12600 (k) 12400 (l) 86100
   (m) 76000
6. (a) 16 (b) 18 (c) 44 (d) 130
   (e) 32 (f) 210 (g) 1090 (h) 35000
   (i) 7 (j) 32 (k) 52 (l) 55
   (m) 13200
7. (a) 11 (b) 14 (c) 4 (d) 16
   (e) 28 (f) 34 (g) 12 (h) 11
   (i) 11 (j) 14 (k) 7 (l) 5
8. (a) 300 km (b) 16 kg (c) 80
   (d) (i) 100 (ii) 110
9. ∠ABC acute ∠PQR acute ∠IJK obtuse
   ∠TLM right ∠DPJ reflex ∠MSD straight
   ∠XWV obtuse ∠UVD acute
10. ∠ABC 67° ∠PQR 115° ∠STV 140°
11. Check drawings
12. a = 70 b = 145 c = 70 d = 50
    e = 70 f = 70 g = 130 h = 51
13. (a) f (b) g (c) d
    (d) b (e) g (f) h
14. (a)



(b)



(c)



15. (a) 7x (b) 3a (c) 4p (d) 4m
    (e) 7t (f) 6x (g) 25m (h) 30g
16. (a) 7a + 10b (b) 4p + 13q (c) m + 8n
    (d) 6x + 12 (e) 8y + 6 (f) 7t + 3
17. (a) 3x + 12 (b) 5x − 10 (c) 4a + 12
    (d) 10p − 20 (e) 6x + 10 (f) 20x − 12
    (g) 12 + 18x (i) 32 − 24a
18. (a) 1 (b) 8 (c) 18 (d) 20
    (e) 0 (f) 30 (g) 15 (h) 25
19. (a) 9 (b) 51 (c) 54 (d) 258
    (e) 16 (f) 30 (g) 66 (h) 360
    (i) 140
20. (a) 9 (b) 9 (c) 23 (d) 40
    (e) 9 (f) 4 (g) 45 (h) 16
    (i) 7 (j) 20 (k) 26 (l) 18
21. (a) 10 (b) −10 (c) 4 (d) 2
    (e) −2 (f) −8 (g) −10 (h) 4
    (i) −5 (j) −3 (k) 0 (l) −5
    (m) −6 (n) −45 (o) −32
22. (a) 4 (b) −7 (c) −3 (d) −7
23. (a) 84 cm² (b) 55 cm² (c) 81 cm²
    (d) 21 cm² (e) 48 cm² (f) 30 cm²
    (g) 165 cm² (h) 35 cm² (i) 240 cm²
24. (a) 528 cm³ (b) 840 cm³ (c) 180 cm³
    (d) (i) 50000 cm³ (ii) 50 litres
25. (a) x = 5 (b) x = 8 (c) x = 12
    (d) x = 11 (e) x = 5 (f) x = −2
26. (a) x = 5 (b) x = 10 (c) x = 25
    (d) x = 8 (e) x = 60 (f) x = 8·5
27. (a) x = 10 (b) x = 9 (c) x = 3
    (d) x = 3 (e) x = 1 (f) x = 0
    (g) x = 6 (h) x = 0 (i) x = 2
28. (a) $\frac{2}{3}$ (b) $\frac{1}{2}$ (c) $\frac{2}{5}$ (d) $\frac{3}{5}$
    (e) $\frac{1}{4}$ (f) $\frac{3}{4}$ (g) $\frac{3}{4}$ (h) $\frac{3}{5}$
29. (a) 1,5 (b) 1,2,4,8 (c) 1,2,3,4,6,12
    (d) 1,3,5,15 (e) 1,3,7,21 (f) 1,2,4,5,10,20
    (g) 1,2,3,4,6,8,12,24 (h) 1,2,5,10,25,50
    (i) 1,13 (j) 1,11 (k) 1,2,4,8,16
    (l) 1,2,3,6,9,18
30. (a) (b) (e) (f) (j) are prime
31. 2,3,5,7,11,13,17,19,23,29

Answers to Chapter 1 - Rounding

Ch 1 - Exercise 1 - page 9

1. (a) 3 (b) 8 (c) 5 (d) 16
   (e) 30 (f) 62 (g) 15 (h) 3
   (i) 23 (j) 73 (k) 64 (l) 27
   (m) 8 (n) 42 (o) 87
2. (a) 16 (b) 23 (c) 14 (d) 96
   (e) 78 (f) 40 (g) 3 (h) 62
   (i) 30 (j) 64 (k) 1 (l) 40
3. (a) 13 (b) 5 (c) 35 (d) 82
   (e) 20 (f) 82 (g) 18 (h) 39

Ch 1 - Exercise 2 - page 9

1. (a) 80 (b) 60 (c) 20 (d) 50
   (e) 60 (f) 80 (g) 60 (h) 80
   (i) 10 (j) 20 (k) 260 (l) 250
   (m) 740 (n) 900 (o) 2010
2. (a) 40 cm (b) 60 cm (c) 80 cm (d) 80 cm
   (e) 90 cm (f) 150 cm (g) 350 cm (h) 610 cm
   (i) 730 cm (j) 500 cm
3. (a) 100 (b) 500 (c) 800 (d) 200
   (e) 600 (f) 800 (g) 400 (h) 100
   (i) 5500 (j) 3600 (k) 6600 (l) 4300
   (m) 7100 (n) 3400 (o) 5400
4. (a) 9000 (b) 14000 (c) 24000 (d) 20000
   (e) 63000 (f) 64000 (g) 2000 (h) 44000
   (i) 66000 (j) 83000 (k) 70000 (l) 124000
   (m) 215000 (n) 147000 (o) 300000

Ch 1 - Exercise 3 - page 10

1. (a) 2500 (b) 2400 (c) 6000 (d) 8000
   (e) 15000 (f) 60000 (g) 20 (h) 20
   (i) 10 (j) 300 (k) 200 (l) 200
2. 2058
3. (a) 1209 (b) 1278 (c) 12017 (d) 7562

Ch 1 - Exercise 4 - page 11

1. (a) 170 (b) 80 (c) 290 (d) 640
   (e) 810 (f) 1150 (g) 2330 (h) 1200
   (i) 9600 (j) 9080 (k) 12340 (l) 76080
2. (a) 1600 (b) 3700 (c) 8100 (d) 6000
   (e) 12300 (f) 23700 (g) 45000 (h) 20600
3. (a) 8000 (b) 23000 (c) 56000 (d) 84000
   (e) 70000 (f) 125000 (g) 260000 (h) 300000

Ch 1 - Exercise 5 - page 11

1. (a) 9 (b) 6 (c) 12 (d) 47
   (e) 99 (f) 120 (g) 630 (h) 482
   (i) 100 (j) 2300 (k) 4630 (l) 1287
2. (a) 4 (b) 8 (c) 16 (d) 47
   (e) 90 (f) 140 (g) 230 (h) 654
3. (a) 8 (b) 14 (c) 29 (d) 40
   (e) 135 (f) 180 (g) 270 (h) 300

Ch 1 - Exercise 6 - page 12

1. (a) 960 (b) 680 (c) 1260 (d) 2170
   (e) 3360 (f) 5650 (g) 4280
2. (a) 4800 (b) 9300 (c) 6500 (d) 12600
   (e) 12600 (f) 6900 (g) 6800 (h) 5200
   (i) 168800 (j) 62000

Ch 1 - Exercise 7 - page 12

1. (a) 28 (b) 8 (c) 25 (d) 30
   (e) 280 (f) 61 (g) 240
2. (a) 41 (b) 123 (c) 32 (d) 45
   (e) 70 (f) 20 (g) 610

Answers to Chapter 2 - Angles

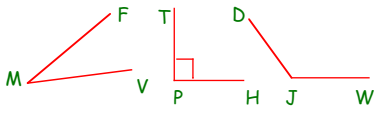
Ch 2 - Exercise 1 - page 14

1. (a) acute (b) obtuse (c) right
   (d) acute (e) obtuse (f) straight
   (g) reflex (h) obtuse
2. (a) acute (b) obtuse (c) right
   (d) acute (e) obtuse (f) right
   (g) acute (h) obtuse
3. obtuse - between 90° and 180°
   right - exactly 90°
   reflex - between 180° and 360°
   straight - exactly 180°
   acute - smaller than 90°
4. (a) acute - 70°, 89°, 14°, 71°
   (b) obtuse - 105°, 137°, 91°, 179°
   (c) right - 90°
   (d) reflex - 200°, 310°
   (e) straight - 180°

Ch 2 - Exercise 2 - page 15

1. (a) ∠ABC (b) ∠FDG (c) ∠LMP
   (d) ∠QTV (e) ∠DTW (f) ∠LCR
   (g) ∠LFT (h) ∠WUZ
2. (a) ∠FRT is right (b) ∠ATS is acute
   (c) ∠MYD is acute (d) ∠ATC is obtuse
   (e) ∠DVF is straight (f) ∠BHJ is reflex
   (g) ∠CJL is acute (h) ∠ZFT is obtuse
3. (a) ∠FVP (b) ∠VPF (c) ∠VFP
   (d) ∠DMR (e) ∠RDM (f) ∠DRM
4. ∠ALC, ∠AFC, ∠FAL, ∠LCY
5. (a) ∠DBC (b) ∠ABD
6. (a) ∠PHS (b) ∠TGF
   (c) ∠TGH (d) ∠GHJ

7/8/9.



Ch 2 - Exercise 3 - page 17

1. (a) 60° (b) 30° (c) 110°
   (d) 140° (e) 50° (f) 160°
2. (a) 25-35 (b) 60-70 (c) 15-25
   (d) 100-110 (e) 85-90 (f) 15-25
   (g) 115-125 (h) 210-220
3. (a) 40° (b) 75° (c) 115°
4. (a) ∠DLT 60° (b) ∠AMZ 32°
   (c) ∠HWV 99° (d) ∠RNJ 133°
   (e) ∠HFX 115° (f) ∠QPK 47°
5. (a) ∠PQR 49° (b) ∠ARC 76°
   (c) ∠IJK 120° (d) ∠LMN 66°
   (e) ∠PQR 92° (f) ∠STV 75°
6. (a) 50° (b) 65° (c) 65°
7. (a) ∠PQR 135° (b) ∠QRP 20° (c) ∠QPR 25°

Ch 2 - Exercise 4 - page 20

1. (a) 360° (b) 360°
2. (a) 220° (b) 140°
3. (a) 120° (b) 150° (c) 90° (d) 140°
   (e) 130° (f) 90° (g) 90° (h) 60°
4. (a) 180° (b) 180°
5. 180°
6. 40°
7. (a) 130° (b) 60° (c) 125°
   (d) 65° (e) 40° (f) 120°
8. $x = y$ always
9. 35°
10. (a) 45° (b) 115° (c) 62°
    (d) 123° (e) 22·5° (f) 90°
11. (a) 30° (b) 150° (c) 150°

Ch 2 - Exercise 5 - page 22

1 - 5. Check drawings

Ch 2 - Exercise 6 - page 23

1. (a) 100° (b) 80°
2. (a) 50° (b) 130° (c) 110° (d) 40°
   (e) 45° (f) 40° (g) 145° (h) 35°
3. (a) 50° (b) 60°
4. "ISOSCELES"
5. (a) 35° (b) 110°
6. (a) ★ = 70° • = 40° (b) ★ = 50° • = 80°
   (c) ★ = 55° • = 70° (d) ★ = 65° • = 50°
   (e) ★ = 40° • = 100° (f) ★ = 72° • = 36°
   (g) ★ = 37° • = 106° (h) ★ = 85° • = 10°
7. (a) 140° (b) 70° (both)
8. (a) 65° (b) 50° (c) 30° (d) 60°
   (e) 35° (f) 75° (g) 25° (h) 67°
9. (a) 50° (b) 50° (c) 80°
10. (a) 52° (b) 52° (c) 76°
11. (a) "EQUILATERAL" (b) 60°

Answers to Chapter 3 - Decimals 1

Ch 3 - Exercise 1 - page 27

1. (a) 0·5 (b) 0·3 (c) 1·2
   (d) 2·3 (e) 3·4 (f) 4·4
2. Check sketches
3. (a) 0·8 (b) 1·3 (c) 2·5
4. (a) 0·82 (b) 0·47 (c) 0·56
   (d) 1·24 (e) 2·69 (f) 0·08
5. Check sketches

Ch 3 - Exercise 2 - page 28

1. (a) 8·3 (b) 13·8 (c) 8·8
   (d) 19·4 (e) 2·8 (f) 1·1
2. (a) 6·4 (b) 13·3 (c) 25·6 (d) 12·0
3. (a) 2·36 (b) 4·83 (c) 3·45
   (d) 12·26 (e) 0·24 (f) 1·74
4. (a) 0·68 (b) 2·44 (c) 1·83
   (d) 3·65 (e) 1·84 (f) 0·25

Ch 3 - Exercise 3 - page 30

1. (a) 6·24 & 6·25 —> 6·25
   (b) 4·83 & 4·84 —> 4·83
   (c) 2·71 & 2·72 —> 2·72
   (d) 1·65 & 1·66 —> 1·65
   (e) 10·20 & 10·21 —> 10·21
   (f) 0·58 & 0·59 —> 0·58
   (g) 6·89 & 6·90 —> 6·90
   (h) 0·02 & 0·03 —> 0·03
2. (a) 5·33 (b) 8·26 (c) 1·94 (d) 0·68
   (e) 12·28 (f) 3·01 (g) 1·70 (h) 0·04
3. (a) 2·35 (b) 1·87 (c) 8·22 (d) 7·28
   (e) 9·33 (f) 4·04 (g) 5·86 (h) 6·05
   (i) 3·90 (j) 0·25 (k) 10·10 (l) 0·07
4. (a) 5·38 (b) 7·41 (c) 2·69
   (d) 11·92 (e) 2·57 (f) 0·85
   (g) 2·09 (h) 2·98 (i) 2·89
5. (a) 0·38 (b) 0·64 (c) 0·26 (d) 0·71
   (e) 0·44 (f) 0·67 (g) 0·76
6. (a) £6·56 (b) 20·83kg (c) £7·43
   (d) $^7/_9$ largest $^9/_{13}$ smallest

Ch 3 - Exercise 4 - page 32

1. (a) 26·54 (b) 55·03 (c) 55·57
   (d) 33·23 (e) 77·47 (f) 45·91
   (g) 12·15 (h) 16·76 (i) 37·59
   (j) 5·55 (k) 36·43 (l) 37·22
2. (a) 19·14 (b) 29·25 (c) 13·21
   (d) 18·32 (e) 32·67 (f) 1·52
3. (a) 11·77 (b) 1·08 (c) 10·92
   (d) 9·85 (e) 23·52 (f) 19·28
4. (a) 6·24m (b) (i) 10·81kg (ii) 0·91kg

Ch 3 - Exercise 5 - page 34

1. (a) 25·38 (b) 14·70 (c) 40·48
   (d) 57·19 (e) 36·72 (f) 7·29
   (g) 66·92 (h) 75·72 (i) 47·43
   (j) 84·15 (k) 55·62 (l) 10·80
2. (a) 22·92 kg (b) 23·10 m (c) £80·73
   (d) 29·36 l (e) 95·26 kg (f) 195·90 m

Ch 3 - Exercise 6 - page 35

1. (a) 8·24 (b) 5·55 (c) 5·89
   (d) 4·77 (e) 8·25 (f) 5·43
   (g) 6·32 (h) 3·42 (i) 0·72
   (j) 8·65 (k) 2·73 (l) 1·91
2. (a) £14·54 (b) 4·16 m (c) 2·34 kg
   (d) 0·69 l (e) 43·12 secs
   (f) (i) 3·74 kg (ii) 11·22 kg extra

Ch 3 - Exercise 7 - page 37

1. (a) 63·4 (b) 41·7 (c) 7·8
   (d) 123·4 (e) 59 (f) 6
   (g) 123·4 (h) 87·8 (i) 639
   (j) 1148·7 (k) 2·1 (l) 450
2. (a) 82·1 (b) 13·7 (c) 9·3 (d) 62
   (e) 141·5 (f) 287 (g) 0·4 (h) 10·5.
3. (a) 631 (b) 247 (c) 135·8 (d) 92·7
   (e) 1416 (f) 103·7 (g) 0·2 (h) 250
4. (a) 2·7 g (b) 27 g
5. (a) 17·5 l (b) 175 l
6. (a) 2134 (b) 376 (c) 15180
   (d) 3·61 (e) 1 (f) 30·3

Ch 3 - Exercise 8 - page 38

1. (a) 0·64 (b) 1·94 (c) 0·321
   (d) 0·065 (e) 6·8 (f) 0·003
   (g) 1·47 (h) 2·263 (i) 0·9
   (j) 0·231 (k) 2·89 (l) 12·31
   (m) 0·483 (n) 0·2981 (o) 0·067
   (p) 0·98 (q) 2·7 (r) 0·065
   (s) 0·531 (t) 1·65 (u) 0·037
2. (a) move all the figures 2 places to the right
   (b) move all the figures 3 places to the right
3. (a) 0·2653 (b) 3·625 (c) 0·0581
   (d) 0·2931 (e) 0·062 (f) 5·87
   (g) 0·48 (h) 18·625 (i) 0·0613
4. (a) £0·23 (b) £0·15 (c) 0·00585 kg
   (d) 9·5cm (e) 8·75 g
5. (a) 1·8cm (b) 3·7cm (c) 0·89cm
   (d) 0·6cm (e) 0·04cm
6. (a) 3·55m (b) 6·02m (c) 0·88m
   (d) 0·253m (e) 0·064m
7. (a) 32·37km (b) 0·965km (c) 0·472km
   (d) 0·0859km (e) 0·0097km

Answers to Chapter 4 - Percentages

Ch 4 - Exercise 1 - page 41

1. (a) $^{23}/_{100} = 0·23$ (b) $^{45}/_{100} = 0·45$
   (c) $^{51}/_{100} = 0·51$ (d) $^{19}/_{100} = 0·19$
   (e) $^{72}/_{100} = 0·72$ (f) $^{8}/_{100} = 0·08$
   (g) $^{2}/_{100} = 0·02$ (h) $^{9}/_{100} = 0·09$
   (i) $^{17·5}/_{100} = 0·175$ (j) $^{6·5}/_{100} = 0·065$
2. (a) $^7/_{20}$ (b) $^7/_{10}$ (c) $^{17}/_{20}$ (d) $^9/_{10}$
   (e) $^1/_2$ (f) $^1/_4$ (g) $^3/_4$ (h) $^1/_{10}$
   (i) $^1/_{20}$ (j) $^4/_{25}$ (k) $^{12}/_{25}$ (l) $^{24}/_{25}$
   (m) $^1/_{50}$ (n) $^3/_5$ (o) $^3/_{20}$ (p) $^{13}/_{50}$
   (q) $^4/_5$
3. (a) 14% (b) 25% (c) 16% (d) 80%
   (e) 70% (f) 65% (g) 50% (h) 10%
   (i) 95% (j) 68% (k) $12^1/_2$% (l) $37^1/_2$%
   (m) 90% (n) 1%
4. (a) 90% (b) 90% (c) 60% (d) 70%
   (e) 76% (f) 70% (g) 75% (h) 50%
5. Science 80%, English 75%,
   History 72%, Maths 70%

Ch 4 - Exercise 2 - page 42

1. (a) £6·40 (b) £9·80 (c) £2·53 (d) £240
   (e) £477 (f) £9·60 (g) £2852 (h) £7·98
   (i) £0·27 (j) £6·50 (k) £2·70 (l) 45p
   (m) £1·10 (n) £0·98 (o) £14 (p) £2·75
2. (a) (i) 99 (ii) 121 (b) 42 l
   (c) sugar 165g, starch 345g, protein 60g,
   fibre 67·5g, fat 37·5g
   (d) 58·5kg (e) £210 (f) 6 hours

Ch 4 - Exercise 3 - page 44

1. £880 2. £350 3. 92 pdls 4. 1560ft
5. 1·68m 6. 54kg 7. 35km/hr 8. 678°C
9. £13·80 10. 7·2km 11. £18720
12. £11340 13. 3840 cu cm
14. (a) £378 (b) £504
    (c) (i) £1040 (ii) £52 (iii) £1092

Ch 4 - Exercise 4 - page 47

1. £18 2. £68 3. £607·20
4. 13000 ft 5. 18°C 6. 84 mph
7. 59·5 kg 8. 3·4 l 9. 5·74 cm
10. £10
11. (a) £16·80 (b) £45·50 (c) £11·20
    (d) £11·55 (e) £21 (f) £84

Answers to Chapter 5 - Scales

Ch 5 - Exercise 1 - page 50

1. Check diagrams
2. Check diagrams

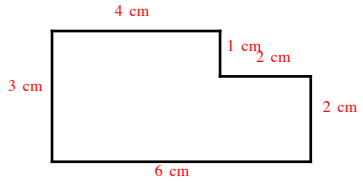
Ch 5 - Exercise 2 - page 52

1. (a) 15 m (b) 22·5 m
2. (a) 80 cm (b) 60 cm (c) 100 cm
3. (a) 200 cm (b) 125 cm
4. 60 m by 90 m (b) 300 m
5. 160 cm = 1·6 m
6. 3·5 m
7. (a) 7·5 m (b) 6·5 m
8. (a) 6 cm by 3 cm (b) 72 ins by 36 ins
9. (a) 3·5 cm (b) 28 m
10. 105 cm (1·05m)
11. (a) 4 cm (b) 14 m
12. (a) 140 miles
    (b) (i) 200 miles (ii) 200 miles
    (iii) 375 miles (iv) 475 miles
    (v) 215 miles
    (c) (i) 11·3 cm, 6 cm, 5·7 cm
    (ii) 565, 300, 285 miles
    (iii) 1150 miles

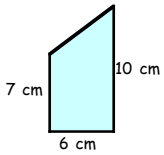
Ch 5 - Exercise 3 - page 55

1. Rectangle 4 cm by 3 cm
2. Rectangle 6 cm by 10 cm
3. Rectangle 8 cm by 6 cm
4. Rectangle 2 cm by 10 cm
5. RAT with short sides 6 cm by 4 cm
6. RAT with short sides 4 cm by 8 cm

7.



8. Isosceles triangle - base 6 cm height 4 cm
9.



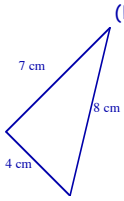
10. (a) RAT with short side 7·5 cm by 4 cm
    (b) 8·5 cm (c) 170 km
11. (a) Rectangle measuring 12 cm by 9 cm
    (c) 15 cm (d) 75 m
12. (a) RAT with short side 3·5 cm by 12 cm
    (b) 12·5 cm (c) 25 m

Ch 5 - Exercise 4 - page 58

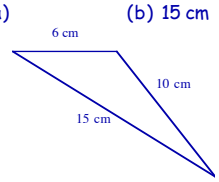
1. (a) RAT with base 4 cm (b) 14 m
2. (a) RAT with base 10 cm
   (b) 12·5 m (c) 25 m
3. (a) RAT with base 8 cm (b) 100 m
4. (a) 13 m (b) 43 m (c) 494 m
   (d) 104 m (e) 62 m (f) 320 m
5. (a) Drawing (b) 12·5 cm (c) 125 m

Ch 5 - Exercise 5 - page 61

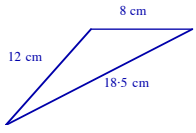
1. Check compass
2. (a) 180° (b) 90° (c) 45°
   (d) 135° (e) 270° (f) 90°
   (g) 90° (h) 90° (i) 270°
   (j) 180°
3. (a) East (b) North
   (c) S.E. (d) N.E.
4. (a) (i) Creepy Woods (ii) Volcano
   (iii) Black Isle (iv) Airport
   (b) (i) S (ii) NE (iii) E (iv) SW
5. (a) (b) 8·1 cm (c) 81 km



6. (a) (b) 15 cm (c) 300 km



7. (a) (b) 18·5 cm (c) 92·5 km



Answers to Chapter 6 - Wages

Ch 6 - Exercise 1 - page 64

1. £310
2. (a) £259 (b) (i) £310·80 (ii) £51·80
3. £852
4. £457·60
5. (a) Ted £322·20, Bill £375·90, Nick £456·45,
   Tam £304·30, Dave £358·00
   (b) £1816·85
6. £111
7. (a) £535·20 (b) £457·15 (c) £78·05
8. (a) Susie £214·50, Sandra £216 (b) £1·50
9. £565·60 10. £1132·50

Ch 6 - Exercise 2 - page 66

1. £6·25
2. £8·20
3. (a) £8·35 (b) £334
4. (a) £8·45 (b) £211·25
5. (a) 162 hrs (b) £11·00
6. Andy £14·60, Val £7·70,
   Thomas £14·40, Jenny £6·05
7. (a) £8·75 (b) £323·75
8. 36 hrs
9. 50 hrs
10. Ian £11·40, Simon £11·50, Simon better
11. No, his pay was short by £2·80

Ch 6 - Exercise 3 - page 68

1. £20640 2. £17403 3. £18153
4. £177 5. £2210 6. £18122
7. £21866 8. £17875
9. (a) £290·50 (b) £15106
10. (a) £298 (b) £15496
11. (a) £22326 (b) £22893 (c) £567
12. (a) Arthur £18174, Sally £20235
    (b) (i) Eve (ii) Arthur
13. No, both paid same

Ch 6 - Exercise 4 - page 70

1. £2155 2. £2215 3. £2524·50
4. £4000 5. £2365·50 6. £263·25
7. £478·75 8. £423·50 9. £245·25
10. £354·50
11. (a) £450·50 (b) £901
12. (a) £1976 (b) £456
13. (a) £520 (b) £13·00
14. (a) £185 (b) £7·40

Ch 6 - Exercise 5 - page 72

1. £21624 2. £19364 3. £103·50
4. (a) £22470 (b) £18375 (c) £14910
5. (a) £25970 (b) yes
6. Norrie by £80
7. (a) £222 (b) £233·10
8. (a) £10·29
   (b) (i) £392 (ii) £411·60 (iii) £19·60
9. (a) £494 (b) £180
   (c) £674 (d) £775·10

Ch 6 - Exercise 6 - page 74

1. (a) £315 (b) £624 (c) £468
2. £1645 3. £240 4. £222
5. (a) £532 (b) £1682
6. £2455
7. (a) £2135 (b) £20635
8. £304
9. (a) £260 (b) £585·50
10. £230

Ch 6 - Exercise 7 - page 76

1. (a) £14 (b) £84
2. (a) £24·80 (b) £99·20
3. (a) £23·20 (b) £185·60
4. (a) (i) £20·40 (ii) £102
   (b) (i) £14·20 (ii) £85·20
   (c) £196 (d) £273·60 (e) £148·40
5. (a) £12·30 (b) £49·20
6. (a) £11·70 (b) £140·40
7. (a) £10·80 (b) £129·60
8. (a) £9·54 (b) £57·24
9. (a) (i) £24·20 (ii) £121
   (b) (i) £18·15 (ii) £90·75
   (c) £30·25
10. B/P = £328, O/t = £73·80, Tot = £401·80
11. B/P = £273·60, O/t = £114, Tot = £387·60
12. B/P = £585·20, O/t = £161·70, Tot = £746·90
13. Total Pay = £535·50

Ch 6 - Exercise 8 - page 80

1. (a) £1135 (b) £1111 (c) £10105
   (d) £797·10 (e) £23026 (f) £289
   (g) £19020 (h) £405·25 (i) £369·05
   (j) £590·85
2. £987·35
3. (a) £17544 (b) £1462
4. £406·75
5. £1886·75
6. (a) £472 (b) £373·50
7. (a) £473 (b) £366·52
8. (a) £598·50 (b) £476·05
9. (a) £718·80 (b) £163·96 (c) £554·84
10. (a) £713·05, £210·70, £502·35
    (b) £528·75, £118·18, £410·57
    (c) £795·47, £226·82, £568·65
    (d) £984·42, £243·42, £741
    (e) £739·15, £207·76, £531·39
11. (a) £1260 (b) £3135·50 (c) £2311·90

Answers to Chapter 7 - Algebra 1

Ch 7 - Exercise 1 - page 85

1. (a) 8x (b) 5x (c) 10x
   (d) 2x (e) 11x (f) 12x
   (g) 3x (h) 3x (i) 5p
   (j) 8a (k) 12t (l) 9g
   (m) d (n) y (o) 3m
   (p) 6x (q) 0 (r) 6a
   (s) 4f (t) 2f (u) 14f
2. (a) x (b) 3y (c) 11x + 2
   (d) 9x + 1 (e) 8a - 1 (f) 4w + 8
   (g) a + 8 (h) y (i) 6x + 8y
   (j) 7a + 10b (k) 3p + 2q (l) 6g + 5h
   (m) 3x + 2y (n) 13a + 1 (o) 8x + 4y
   (p) 6p + 3q (q) 4g + 5h (r) x + y + 7
   (s) $p^2 + q^2$

Ch 7 - Exercise 2 - page 86

1. (a) 5a (b) 3p (c) 2t (d) 7y
   (e) 8m (f) 2w (g) ab (h) cf
   (i) dy (j) a^2 (k) b^2 (l) m^2
   (m) 2de (n) 5pq (o) 7mn (p) $4a^2$
   (q) $7b^2$ (r) 6rs (s) 15uv (t) 35gh
   (u) $6a^2$ (v) $14m^2$ (w) $3f^2$ (x) $32w^2$

Ch 7 - Exercise 3 - page 86

1. (a) 2x + 2 (b) 3x - 6 (c) 4x + 28
   (d) 5x - 15 (e) 7y - 7 (f) 9t - 18
   (g) 10a + 70 (h) 20w + 100 (i) 17y + 17
   (j) 3x - 3y (k) 5a + 5b (l) 2p - 2q
   (m) 8g + 8h (n) 2x + 2y + 4 (o) 6x + 6y + 6
   (p) 5x - 5y - 10 (q) 6x + 3 (r) 18a - 12
   (s) 12p - 8 (t) 14t + 35 (u) 20q - 4
   (v) 500v - 200 (w) 6x + 9y + 3 (x) 8x - 2y + 10
2. (a) 2x + 3 (b) 3x + 10 (c) 4w + 3
   (d) 5v (e) 3x + 8 (f) 7y + 8
   (g) 8g + 14 (h) w - 6 (i) x - 3
   (j) 7y - 5 (k) 12x + 24 (l) 13h - 6
   (m) 3x + 5 (n) 2x + 14 (o) 2x + 4
   (p) 4x + 2 (q) 4x + 6 (r) 7y + 12
   (s) 11y + 5 (t) 15w + 15 (u) 5a + 24
   (v) 8c + 2 (w) 5x + 14 (x) 8x + 2
   (y) 8x

Ch 7 - Exercise 4 - page 87

1. (a) x = 2 (b) x = 4 (c) x = 8
   (d) x = 12 (e) x = 4 (f) x = 20
   (g) x = 10 (h) x = 90 (i) x = 0
   (j) x = 4 (k) x = 1 (l) x = 200
   (m) x = 3 (n) x = 4 (o) x = 6
   (p) x = 63 (q) x = 5 (r) x = 0

2. (a) x = 6 (b) m = 8 (c) p = 7
(d) q = 5 (e) t = 3 (f) a = 10
(g) b = 8 (h) d = 3 (i) x = $3\frac{1}{2}$
(j) p = $5\frac{1}{2}$ (k) p = $3\frac{1}{2}$ (l) m = $3\frac{1}{2}$
(m) x = $10\frac{1}{2}$ (n) t = $2\frac{1}{2}$ (o) p = $2\frac{1}{2}$
(p) b = $4\frac{1}{2}$ (q) c = $3\frac{3}{4}$ (r) n = $5\frac{1}{4}$

Ch 7 - Exercise 5 - page 88

1. (a) x = 3 (b) x = 5 (c) x = 2
(d) x = 7 (e) x = 3 (f) x = 5
(g) x = 7 (h) x = 7 (i) x = 8
(j) x = 8 (k) x = 3 (l) x = 5
(m) x = 3 (n) x = 1 (o) x = 0
(p) x = 22 (q) x = 1 (r) x = $\frac{1}{2}$
(s) x = $2\frac{1}{2}$ (t) x = $2\frac{1}{2}$ (u) x = 6

Ch 7 - Exercise 6 - page 89

1. (a) x = 1 (b) x = 2 (c) y = 3
(d) p = 4 (e) w = 2 (f) m = 6
(g) a = 3 (h) x = 7 (i) p = 8
(j) g = 3 (k) x = 2 (l) x= 30
(m) d = 3 (n) p = 6 (o) r = 4

Ch 7 - Exercise 7 - page 89

1. (a) x = 2 (b) x = 5 (c) x = 6
(d) x = 8 (e) x = 6 (f) x = 10
(g) x = 10 (h) x = 20 (i) x = 1
(j) x = 5 (k) x = 3 (l) x = 4
(m) x = 2 (n) x = 5 (o) x = 7
(p) x = 7 (q) x = 22 (r) x = 5

Answers to Chapter 8 - Money 1

Ch 8 - Exercise 1 - page 91

1. Earn Interest, Security
2. £240 3. £1050
4. (a) £260 (b) £230
(c) £399 (d) £280·85
5. (a) £540 (b) £756
6. Brian £192·40, Julie £192, Brian 40p more
7. (a) £240 (b) £6240
8. (a) £119 (b) £3519
9. (a) £4200 (b) £824
(c) £2261·60 (d) £18567·50
10. (a) 2·9% (b) £203
11. (a) £16·10 (b) £352
(c) £130·50 (d) £768
12. (a) £120 (b) £10 (c) £80
13. (a) £144 (b) £12 (c) £60
14. (a) £60 (b) £12
(c) £180·60 (d) £5500
15. (a) £630 (b) £420 (c) £15420

Ch 8 - Exercise 2 - page 94

1. (a) £1·98 (b) £4·52 (c) £15·34
(d) £9·65 (e) £6·40 (f) £6·68
(g) £8·10 (h) £9·89 (i) £11·37
(j) £6·27 (k) £8·00 (l) £21·40
2. £156
3. (a) £667·20 (b) £129·42 (c) £199·02
(d) £70·80 (e) £133·50 (f) £120·06
4. (a) £76·80 (b) £912 (c) £229·68
(d) £594 (e) £84 (f) £65·52
(g) £288

Ch 8 - Exercise 3 - page 96

1. (a) 660 (b) (i) 8844p (ii) £88·44
(c) £4·42 (d) £92·86
2. Units 1220, Charge £163·48, Due £171·65
3. (a) £127·32
(b) £94·41
(c) £117·79
(d) £162·07
(e) £168·55
(f) £141·49

Answers to Chapter 9 - Circle

Ch 9 - Exercise 1 - page 100

1. Check drawing
2. (a) radius (b) diameter
(c) radius (d) diameter
3. (a) TG (b) OG (or OT) (or OP)
4. Check drawing D = 8 cm = 2 x AO
5. (a) 14 cm (b) 10 cm
(c) $15\frac{1}{2}$ cm (d) 8·6 cm

Ch 9 - Practical Exercise - page 101

1. To show that in all cases C ÷ D = 3·14
2. To show that in all cases C ÷ D = 3·14
3. 4 x 3·14 = 12·56 cm

Ch 9 - Exercise 2 - page 102

1. 18·84 cm 2. 34·54 cm 3. 25·12 cm
4. (a) 15·7 cm (b) 69·08 cm (c) 12·56 cm
(d) 116·18 cm (e) 14·76 cm (f) 29·2 cm
(g) 40·82 cm (h) 2·512 cm
5. 37·68 cm
6. (a) 4·2 cm (b) 13·188 cm
7. 5·024 cm
8. (a) 18·84 cm (b) 94·2 cm (c) 19·47 cm
(d) 533·8 cm (e) 15·7 cm (f) 40·19 mm
(g) 100·5 mm
9. 320·3 cm 10. 150·7 cm 11. 113 cm
12. 100 cm 13. 133·45 cm 14. 138·2 cm
15. 163·3 cm
16. (a) 141·3 m (b) 3532·5 m
17. 58·09 cm 18. 45·53 m 19. 15·7 cm
20. (a) 42·39 cm (b) 423·9 cm

Answers to Chapter 10 - DST

Ch 10 - Exercise 1 - page 107

1. (a) 0330 (b) 0145 (c) 0400
(d) 1330 (e) 1515 (f) 1700
(g) 0515 (h) 2040 (i) 0245
(j) 0725 (k) 1200 (l) 0050
(m) 1250 (n) 2130 (o) 0355
(p) 2010 (q) 2255 (r) 0935
(s) 2320 (t) 1032 (u) 2150
2. (a) 1·30 am (b) 11·20 am (c) 9·05 am
(d) 1·30 pm (e) 3·40 pm (f) 10·15 pm
(g) 2·50 am (h) 7·35 pm (i) 6·10 pm
(j) 4·01 pm (k) noon (l) 8·30 am
(m) 5·50 am (n) 2·20 pm (o) 11·05 pm
(p) 7·55 pm (q) 12·30 am (r) 7·35 am
(s) 11·35 am (t) 8·20 pm (u) 11·55 pm

Ch 10 - Exercise 2 - page 108

1. (a) 3 hrs (b) $3\frac{1}{2}$ hrs
(c) $5\frac{1}{2}$ hrs (d) 3 hrs 45 mins
(e) 1 hr 35 mins (f) 7 hrs 55 mins
(g) 2 hrs 5 mins (h) 25 mins
(i) 1 hr 50 mins (j) 1 hr 50 mins
2. 2 hrs 45 mins
3. (a) (i) 1 hr 5 mins (ii) 45 mins
(iii) 6 hrs 35 mins
(b) (i) 2·45 pm (ii) 3·30 pm
4. (a) 1 hr 20 mins, 1 hr 25 mins
(b) 1·45 pm, 1·10 am
(c) Pitlochry, 1 hr 10 mins
Kingussie, 45 mins
(d) Pitlochry, 15 mins
Perth, 24 mins
(e) John O'Groats -> Stirling 10 mins longer
(f) Daytime Stirling -> John O'Groats as it takes less time
5. $4\frac{1}{2}$ hours
6. (a) 6 hrs 45 mins
(b) 10 mins after midnight
7. (a) BBC2 (b) 25 mins (c) 3 hrs 25 mins
(d) 15 mins
(e) not possible, prog lasts 10 mins too long

Ch 10 - Exercise 3 - page 111

1. (a) 8 km (b) 20 km
(c) 27 km (d) 160 km
2. (a) 96 miles (b) 480 miles
(c) 1440 miles (d) 42 miles
3. (a) 25 miles (b) 12 miles (c) 100 miles
(d) 140 km (e) 1650 miles
4. (a) 2 miles (b) 6 miles (c) 15 miles
(d) 30 km (e) 21 km
5. (a) 3 hrs, 960 miles (b) 32 miles
(c) 15 km

Ch 10 - Exercise 4 - page 112

1. (a) 5 mph (b) 4 km/hr
(c) 14 mph (d) 175 km/hr
2. (a) 15 km/hr (b) 50 mph (c) 20 m/s
(d) 7·5 km/hr (e) 6000 mph (f) 70000 km/hr
3. (a) 60 mph (b) 750 mph (c) 91 mph
(d) 9 mph (e) 61 mph
4. (a) 39 mph (b) 30 mph (c) 18 mph
(d) 8 mph (e) 1 metre/hr
5. (a) 8 km/hr (b) 48 mph (c) 36 km/hr
(d) 40 km/hr (e) 400 mph
6. 60 km/hr
7. (a) $1\frac{1}{2}$ hrs (b) 200 mph
8. 2·5 mph

Ch 10 - Exercise 5 - page 114

1. (a) 1 hr 30 mins (b) 3 hrs 30 mins
(c) 5 hrs 15 mins (d) 4 hrs 45 mins
(e) 6 hrs 30 mins (f) 8 hrs 15 mins
(g) 3 hrs 30 mins (h) 2 hrs 30 mins
(i) 4 hrs 15 mins (j) 1 hr 15 mins
(k) 2 hrs 45 mins (l) 45 mins
2. (a) 3·5 hrs (b) 2·25 hrs (c) 5·75 hrs
(d) 1·25 hrs (e) 6·5 hrs (f) 4·5 hrs
(g) 1·75 hrs (h) 7·75 hrs
3. (a) 1 hr (b) 6 hrs (c) 20 secs
(d) 8 hrs (e) 5 hrs (f) 2 hrs
(g) 2 hrs (h) $1\frac{1}{2}$ hrs
4. (a) 1 pm (b) 5 pm (c) 8·45 am
5. (a) 1 hr 30 mins (b) 2 hrs 30 mins
(c) 100 secs (d) 2 hrs 30 mins
6. (a) 80 miles, 2 hrs (b) 50 miles, 1 hr
(c) 90 miles, $1\frac{1}{2}$ hrs
7. (a) $1\frac{1}{2}$ hrs (b) 8·15 am
8. (a) $4\frac{1}{2}$ hrs (b) 8 pm
9. (a) 5 secs

Ch 10 - Exercise 6 - page 116

1. (a) 4 hrs (b) 25 km/hr (c) 160 miles
(d) 40 km/hr (e) 2 hrs 30 mins (f) 10 m
2. 110 km/hr 3. 2 hrs 30 mins
4. 63 km 5. 160 mph
6. 1 hr 15 mins 7. 38750 miles
8. (a) 4 mph (b) 15 mins
9. 3000 miles 10. 6 minutes
11. All three

Ch 10 - Exercise 7 - page 118

1. (a) 1 hour (b) $\frac{1}{2}$ hour
(c) 1430 (d) 1530
(e) (i) 50 mph (ii) 0 mph (iii) 30 mph
2. (a) 1 hour (b) 40 mph, 60 mph
(c) return
3. (a) 20 km/hr (b) 60 km/hr
(c) 11·45 am (d) 15 km
4. (a) B
(b) (i) 80 km/hr (ii) 80 km/hr (c) 9·30 am

5. (a)

Leigh	Bewly		Harton		Kemp
depart	*arrive*	*leave*	*arrive*	*leave*	*arrive*
4·00 pm —>	5·00	5·30	6·30	6·50	7·50

(b) (i) 120 km (ii) 100 km
(c) (i) 120 km/hr (ii) 80 km/hr
(iii) 100 km/hr (iv) 80 km/hr

6. (a) Spiers (b) S(40 secs) G(47·5 secs)
(c) Goodman (d) S(80 secs) G(47·5 secs)
(e) 60 sescs (f) 25 secs
(g) 5 m/secs (h) 2·5 m/sec
(i) 4·2 m/sec (j) Spiers

Answers to Chapter 11 - Fractions

Ch 11 - Exercise 1 - page 124

1. (a) $^1/_2$ (b) $^1/_4$ (c) $^1/_3$ (d) $^1/_6$
(e) $^1/_5$ (f) $^3/_4$ (g) $^7/_{10}$ (h) $^5/_6$
(i) $^2/_3$ (j) $^5/_8$
2. (a) Any 6 boxes (b) Any 3
(c) Any 4 (d) Any 9
(e) Any 10 (f) Any 7
3. (a) $^1/_3$ (b) $^1/_3 = {}^2/_6$
4. (a) $^1/_2 = {}^2/_4$ (b) $^1/_3 = {}^2/_6$ (c) $^9/_{12} = {}^3/_4$
5. (a) $^{10}/_{15}$ (b) $^{12}/_{18}$
(c) $^4/_6$, $^6/_9$, $^8/_{12}$, $^{14}/_{21}$, $^{20}/_{30}$, etc.
6. (a) eg $^2/_4$ (b) eg $^6/_8$ (c) eg $^4/_{10}$
(d) eg $^{10}/_{12}$ (e) eg $^2/_6$ (f) eg $^6/_{20}$
7. (a) (i) $^5/_6$ (ii) $^4/_5$ (iii) $^{10}/_{11}$
(iv) $^7/_{12}$ (v) $^8/_{15}$ (vi) $^9/_{13}$
(b) (i) $^3/_4$ (ii) $^4/_5$ (iii) $^1/_6$
(iv) $^7/_8$ (v) $^{10}/_{11}$ (vi) $^5/_9$
(c) (i) $^1/_2$ (ii) $^4/_5$ (iii) $^9/_{20}$
(iv) $^3/_{10}$ (v) $^5/_{11}$ (vi) $^{40}/_{41}$
8. (a) $^2/_3$ (b) $^1/_3$ (c) $^1/_2$ (d) $^2/_3$
(e) $^3/_4$ (f) $^4/_5$ (g) $^3/_4$ (h) $^1/_4$
(i) $^2/_3$ (j) $^3/_{10}$ (k) $^1/_3$ (l) $^3/_4$
(m) $^2/_3$ (n) $^2/_5$ (o) $^3/_4$ (p) $^1/_4$
(q) $^3/_8$ (r) $^1/_2$ (s) $^2/_3$ (t) $^4/_5$

Ch 11 - Exercise 2 - page 126

1. (a) 9 (b) 5 (c) 7
(d) 20 (e) 7 (f) 2
(g) 4 (h) 5 (i) 2
(j) 4 (k) 13 (l) 4
2. (a) 62 (b) 73 (c) 105
(d) 256 (e) 336 (f) 273
(g) 300 (h) 121 (i) 32
3. (a) 20 (b) 18
(c) 6 (d) 24 (e) 15
(f) 12 (g) 24 (h) 4
(i) 12 (j) 35 (k) 35
(l) 6 (m) 63 (n) 180
4. (a) 96 (b) 210
(c) 80 (d) 420 (e) 1190
(f) 51 (g) 150 (h) 156
(i) 560 (j) 160 (k) 576
5. (a) (i) 510 (ii) 340
(b) (i) £96 (ii) £160
(c) (i) 84 (ii) 12

Ch 11 - Exercise 3 - page 128

1. 25% = $^1/_4$, 50% = $^1/_2$, 20% = $^1/_5$, 10% = $^1/_{10}$
100% = 1 , $33^1/_3\%$ = $^1/_3$, 1% = $^1/_{100}$, 5% = $^1/_{20}$
2.

%	100	50	$33^1/_3$	25	20	10	5	2
fr	1	$^1/_2$	$^1/_3$	$^1/_4$	$^1/_5$	$^1/_{10}$	$^1/_{20}$	$^1/_{100}$

3. (a) £40 (b) 12 (c) 900
4. (a) £5 (b) £100 (c) £4 (d) 60
5. (a) £3 (b) £102 (c) £500
6. (a) £80 (b) £8 (c) £11
(d) £8 (e) £37 (f) £20
(g) £3 (h) £4 (i) £90
(j) £600 (k) £40 (l) £2
7. 420
8. (a) £90 (b) £270
9. (a) £15 (b) £30

Ch 11 - Exercise 4 - page 129

1. (a) $^3/_4$ (b) $^2/_5$ (c) $^3/_5$ (d) $^4/_5$
(e) $^2/_3$ (f) $^3/_{10}$ (g) $^7/_{10}$ (h) $^9/_{10}$
2. LEARNED
3. (a) £12 (b) £32 (c) £12 (d) £14
4. (a) (i) £20 (ii) £60
(b) (i) £3 (ii) £9
(c) (i) £8 (ii) £32
(d) (i) £6 (ii) £12
(e) (i) £9 (ii) £63
(f) (i) £12 (ii) £36
(g) (i) £30 (ii) £60
(h) (i) £30 (ii) £270
(i) (i) £14 (ii) £7
(j) (i) £6 (ii) £42
5. (a) £9 (b) £14 (c) £9
(d) £24 (e) £21 (f) £35
(g) £27 (h) £12 (i) £60
(j) £120
6. (a) £90 (b) £30

Answers to Chapter 12 - Statistics 1

Ch 12 - Exercise 1 - page 132

1. (a) Sch bus (b) Train (c) 60
(d) 9 (e) $^1/_3$
2. (a) 2500
(b) Flight simulator (c) 500
(d) Faldo sold 2000 less ?? (e) $^1/_5$
3. (a) 4 (b) Liverpool (c) Spurs
(d) Arsenal & Chelsea
(e) 1 (f) 20 (g) $^1/_4$
4. (a) Sky Movies (b) Disney
(c) Sky1 & ITV4 (d) 100 million (e) Sky Sports
5. (a) 30000 (b) 20000
(c) Peugot Bar Graph is lower in 2012
(d) 310000 (e) Vauxhall & Rover
(f) Peugot
6. (a) 10 am - 11 am (b) 3 pm (c) 3°F
(d) 9 am - 3 pm (e) 100·5 °F
7. (a) 8 am (b) 24°C at 1 pm
(c) Pupils leave doors open at lunchtime .....
(d) 12°C (e) 3 pm
8. (a) Decent weather (b) Oct/Nov
(c) (i) Sept/Oct (ii) Feb/Mar
(d) Jan, wet (e) weather improves
(f) 100 (g) falling
9. (a) Fish, Chicken, Pizza/Sausage
(b) Pizza, Sausage
(c) (i) $^1/_2$ (ii) $^1/_4$ (iii) $^1/_8$
(d) (i) 20 (ii) 10 (iii) 5
10. (a) Peter Griffin (b) Bart Simpson
(c) (i) $^1/_4$ (ii) $^1/_6$ (iii) $^1/_{12}$ (iv) $^1/_8$
(d) (i) 6 (ii) 4 (iii) 2 (iv) 3
(e) 9
11. (a) (i) 20 (ii) 40 (b) 80 (c) 340 apples

Ch 12 - Exercise 2 - page 137

1. (a) 60 kg (b) 120 cm (c) Sam & Gary
(d) Dave & Joe (e) Sam (f) Joe
(g) 42·5 kg (h) 5 kg (i) 5 cm
2. (a) As temperature rises, sales of soup fall
(b) about 8 (c) 22 (d) about 10°C
3. (a) More miles travelled, higher the cost
(b) no miles -> no cost
(c) about 3 miles (d) about £14
4. (a) Check answers
(b) (i) Tony Blair (ii) Tiger Woods
(iii) Madonna
5. £pd.sq
6. (a) When will we meet (b) Bye for now

Ch 12 - Exercise 3 - page 140*

1. (a) 24, 25, 26, 26, 27, 28
(b) (i) 17 (ii) 2
(c) 37 (d) 12 (e) "twenties"
2. (a) £1·40, £1·70, £2·00, £2·20, £2·20, £2·40, £2·70, £2·80, £2·90, £3·10, £3·10, £3·10, £3·40, £3·90, £4·30, £5·50, £5·60, £5·70, £5·80
(b) £2 level
(c) £3·10 (d) 6 (e) 19
3. (a) (i) 1 (ii) 0 (iii) 2
(b) 21 (c) 30 (d) 47
4. (a)

New Members' Ages	
3	0
4	
5	8 9
6	1 2 2 2 3 4 5 7
7	1 4 6 7

(b) (i) 30 (ii) 77
(c) nobody in their "40"s
5. (a) seventies (b) 232 (c) 278
(d) those in their "70"'s

Ch 12 - Exercise 4 - page 142

1. Check pictograph
2. Check graph
3. (a) Check graph (b) Xmas sales
4. Check diagram (b) Joe
5. Check diagram

Ch 12 - Exercise 5 - page 144

1. (a) 12 - 2 = 10
(b) 95 - 21 = 74
(c) 8·4 - 1·9 = 6·5
2. (a) 5 (b) 2 (c) 241
3. (a) 5 (b) 29 (c) 11
(d) 5 (e) £17 (f) 25·5
4. (a) 6 (b) 16 (c) £14
(d) 22 cm (e) 4·8 (f) 3·60
5. (a) 18 cm (b) 181 cm (c) 182 cm
6. (a) (i) 52·5 (ii) No mean says 52
(b) 52·5 (c) 54
7. (a) 103 (b) 104
8. (a) 44 (b) 40 (c) 49
9. 35 kg 10. 12
11. 9 12. 7 cm

Answers to Chapter 13 - Pythagoras

Ch 13 - Exercise 1 - page 151

1. (a) 36 (b) 16 (c) 4 (d) 25
(e) 81 (f) 100 (g) 1 (h) 9
(i) 0 (j) 64
2. (a) 256 (b) 484 (c) 361 (d) 1681
(e) 1024 (f) 2500 (g) 289 (h) 2809
(i) 7225 (j) 8649 (k) 10201 (l) 40000
3. (a) 64 cm^2 (b) 144 cm^2 (c) 225 cm^2 (d) 25 cm^2
4. 473 cm^2
5. (a) 25 (b) 85 (c) 125 (d) 68
(e) 202 (f) 29 (g) 245 (h) 394

6. (a) 1, 3, 5, 7, 9, 11, 13 (b) 15
   (c) 17, 19, 21
7. (a) 225 cm² (b) 81 cm² (c) 144 cm²
8. (a) 48 cm²

Ch 13 - Exercise 2 - page 153

1. (a) 5 (b) 4 (c) 3
   (d) 8 (e) 11 (f) 2
2. (a) 6 (b) 1 (c) 9 (d) 10
3. (a) 8 (b) 9 (c) 11 (d) 20
   (e) 25 (f) 30 (g) 16 (h) 13
   (i) 1·2 (j) 1·8
4. (a) 3·74 (b) 4·36 (c) 6·08 (d) 8·25
   (e) 9·64 (f) 10·72 (g) 14·39 (h) 17·32
   (i) 22·80 (j) 27·11
5. 8·94 cm
6. 11·83 cm

Ch 13 - Exercise 3 - page 154

1. (a) 36, 64, 100 (b) 100 (c) OK
2. (a) 25, 144, 169 (b) 169 (c) OK
3. (a) 64, 225, 289 (b) 289 (c) OK
4. (a) 81, 144, 225 (b) 225 (c) OK
5. (a) 100, 576, 676 (b) 676 (c) OK
6. (a) 225, 400, 625 (b) 625 (c) OK

Ch 13 - Exercise 4 - page 156

1. 5 cm
2. 13 cm
3. (a) 20 cm (b) 17 cm (c) 25 cm
4. 8·94 cm
5. 11·18 cm
6. 15·81 cm
7. 20·81 cm
8. 18·77 cm
9. (a) 10·82 cm (b) 16·12 cm (c) 17·46 cm
   (d) 7·28 m (e) 33·02 mm (f) 27·78 cm
   (g) 41·34 mm (h) 90·79 m (i) 11·01 cm
   (j) 126·13 cm (k) 117·65 m (l) 22·83 cm

Ch 13 - Exercise 5 - page 159

1. 25 m 2. 7·5 m 3. 89·02 km
4. 142·13 m 5. 25·71 m 6. 30·02 cm
7. 35·51 cm 8. 75 m 9. 3·52 m
10. 17 cm 11. 21·93 cm 12. 13·14 m

Ch 13 - Exercise 6 - page 161

1. 36 cm
2. (a) 10·39 cm (b) 18·33 cm (c) 16·52 cm
   (d) 8·49 m (e) 20·66 mm (f) 26·53 cm
   (g) 12·96 cm (h) 41·08 m

Answers to Chapter 14 - Area 1

Ch 14 - Exercise 1 - page 163

1. (a) 12 (b) 12 cm²
2. (a) 5 cm² (b) 8 cm² (c) 8 cm²
   (d) 9 cm² (e) 15 cm² (f) 10 cm²
   (g) 14 cm² (h) 10 cm² (i) 14 cm²
   (j) 11 cm² (k) 14·5 cm²
3. (a) 8 cm² (b) 14 cm² (c) 8 cm²
   (d) 24 cm² (e) 8 cm²
4. (a) 4·5 cm² (b) 7 cm² (c) 15 cm²
   (d) 16 cm² (e) 14 cm² (f) 8 cm²
   (g) 15 cm² (h) 21 cm²
5. (a) 25-26 cm² (b) 25-26 cm²
   (c) 28 cm² (d) 32-33 cm²

Ch 14 - Exercise 2 - page 167

1. (a) Check drawing
   (b) 10 boxes (c) 10 cm²
2. 45 cm²
3. (a) 35 cm² (b) 32 cm² (c) 30 cm²
   (d) 66 cm² (e) 25 cm² (f) 48 cm²
4. (a) 20 m² (b) 8 m² (c) 15 m²
   (d) 60 m² (e) 98 m²
5. (a) 270 m² (b) 391 m² (c) 875 m²
   (d) 3145 m² (e) 1554 m²

Ch 14 - Exercise 3 - page 169

1. (a) Check drawing
   (b) 24 cm² (c) 12 cm²
2. (a) Check drawing
   (b) 24 cm² (c) 12 cm²
3. (a) Check drawing
   (b) 16 cm² (c) 8 cm²
4.

	Area Rect	Area Triangle
(a)	28 cm²	14 cm²
(b)	40 cm²	20 cm²
(c)	18 cm²	9 cm²
(d)	64 cm²	32 cm²
(e)	42 cm²	21 cm²
(f)	50 cm²	25 cm²
(g)	72 cm²	36 cm²

5. (a) Check sketch (b) 35 cm²
6. (a) 33 cm² (b) 63 cm²
   (c) 35 cm² (d) 130 cm² (e) 105 cm²
   (f) 84 cm² (g) 200 cm² (h) 72 cm²
   (i) 38·5 cm² (j) 67·5 cm² (k) 136·5 cm²
7. (a) 6 m² (b) 27 m²
   (c) 200 mm² (d) 825 mm² (e) 60 m²
   (f) 247 cm² (g) 875 mm² (h) 28·5 m²
8. (a) 1305 m² & 1320 m² → West field larger
   (b) 15 m²
9. 306 cm²
10. 86·5 cm²
11. 29·25 cm²
12. 8·1 m²

Ch 14 - Exercise 4 - page 174

1. (a) (b) Check drawing
   (c) 28 cm² (d) 14 cm²
2. (a) 12 cm² (b) 6 cm²
3. (a) 10 cm² (b) 15 cm²
   (c) 36 cm² (d) 60 cm² (e) 72 cm²
   (f) 175 cm² (g) 575 cm² (h) 187 cm²
4. (a) 45·1 cm² (b) 70·2 cm² (c) 225 mm²
   (d) 980 m² (e) 41·8 cm² (f) 1040 m²
   (g) 36·75 m² (h) 1237·5 mm² (i) 3844 mm²
5. B by 7 m²
6. 2700 cm²

Ch 14 - Exercise 5 - page 176

1. (a) 375 cm² (b) 112 cm² (c) 487 cm²
2. (a) 900 cm² (b) 154 cm² (c) 1054 cm²
3. (a) 142 cm²
   (b) 270 cm² (c) 428 cm² (d) 270 cm²
   (e) 196 cm² (f) 196 cm² (g) 330 cm²
4. 70 cm²
5. 70 cm²
6. (a) 195 cm² (b) 370 cm² (c) 255 cm²
   (d) 2250 mm² (e) 42 m² (f) 105 cm²
7. (a) 100 cm² (b) 180 cm² (c) 114 cm²
   (d) 750 cm² (e) 132 cm²

Answers to Chapter 15 - Money B

Ch 15 - Exercise 1 - page 180

1. (a) £80 (b) £0·30 (c) £600
   (d) £36 (e) £18 (f) £0·60
   (g) £50 (h) £4·50 (i) 8p
   (j) £21 (k) £38 (l) £30
   (m) £60 (n) £7·50 (o) £48
   (p) £54 (q) £35 (r) £3000
   (s) £64 (t) £32 (u) £2·40
   (v) £56 (w) £1·60 (x) £12
2. (a) £50 (b) £100
3. (a) £240 (b) £1040
4. (a) £800 (b) £16800
5. (a) 90 litres (b) 30 litres
6. (a) 4°C (b) 20°C
7. (a) 6 m (b) 14 m
8. (a) $33\frac{1}{3}$% of 240 (b) 5
9. 60
10. 108 people

Ch 15 - Exercise 2 - page 182

1. £90 2. £12·50 3. £6500
4. £21700 5. £162 6. £6·50
7. £3300 8. £495
9. (a) £34·25 (b) £20·75
10. £12·50
11. £19·50
12. £35
13. (a) £87 (b) £12
14. £1 440 000
15. 35p
16. (a) 20 (b) £12 (c) £5·50
17. (a) 15 (b) £172·50 (c) £22·50

Ch 15 - Exercise 3 - page 185

1. (a) £830 (b) £830 (c) £80
2. (a) £2140 (b) £340
3. (a) £1069·50 (b) £119·50
4. (a) £523 (b) £58
5. (a) £215 (b) £20
6. (a) £18900 (b) £1150
7. (a) £365 (b) No
   (c) They want the sale
8. (a) £2700 (b) £450
9. (a) £570 (b) £57
10. (a) Nil (b) £23
11. (a) £708·50 (b) £58·50
12. (a) £52500 (b) £7500

Ch 15 - Exercise 4 - page 188

1. (a) £582·90 (b) £609
2. £689·50
3. £1273
4. (a) £705·50 (b) £367·50 (c) £338
5. £272·80
6. (a) £188·80 (b) £106·20 (c) £212·40
   (d) £64·90 (e) £88·50 (f) £56·05
7. (a) £355·10 (b) £279·00
   (c) £634·10 (d) £52·84
8. (a) £682·50 (b) £277·30
   (c) £959·80 (d) £79·98
9. (a) £532 (b) £612·50 (c) £80·50
10. (a) £785 (b) £798·20
    (c) Brown, Brown and Black by £13·20
    (d) £773·60

Ch 15 - Exercise 5 - page 191

1. (a) £4·00 (b) £200
2. £93
3. £200
4. (a) £267 (b) £430 (c) £77·50
   (d) £182·25 (e) £344 (f) £246
5. (a) £8·70 (b) £261
6. (a) £5·15 (b) £257·50
7. (a) £3·58 (b) £286·40
8. (a) £216·50 (b) £143·20 (c) £130·35
   (d) £621 (e) £230·85 (f) £361

Ch 15 - Exercise 6 - page 193

1. 500€
2. 312·50€
3. $1280
4. 1800 dollars
5. (a) 7750€ (b) 112·50€ (c) $864
   (d) 675 dollars (e) 81·25€ (f) $512

6. £73·20
7. £520
8. £110·50
9. £570
10. (a) £304 (b) £48·64 (c) £798·75
    (d) £2·25 (e) £136 (f) £3104
11. (a) 500€ (b) £40
12. (a) £1040 (b) £60

Answers to Chapter 16 - Patterns

Ch 16 - Exercise 1 - page 196

1. (a) Check drawing (b) 3, 6, 9, 12, 15, 18
   (c) 3 (d) 3
   (e) M = 3 x T (f) 120
2. (a) Check drawing (b) 5, 10, 15, 20, 25, 30
   (c) 5 (d) 5
   (e) C = 5 x P (f) 100
3. (a) Check table (b) 6
   (c) W = 6 x H (d) 60
4. (a) Check table (b) 8
   (c) C = 8 x F (d) £120
5. (a) 12 (b) M = 12 x K
   (c) 360 mins
6. (a) 6 (b) P = 6 x B
   (c) 120 pgs
7. (a) A = 40 x T (b) T = 7 x L
   (c) G = 120 x C (d) C = 2·5 x I
   (e) M = 330 x B (f) H = 5 x N

Ch 16 - Exercise 2 - page 200

1. (a) Check drawing (b) 3, 5, 7, 9, 11, 13
   (c) 2 (d) M = 2 x T + 1 (e) 21
2. (a) Check drawing (b) 8, 12, 16, 20, 24, 28...
   (c) 4 (d) C = 4 x T + 4 (e) 52
3. (a) Check drawing (b) 3, 6, 9, 12, 15, 18, 21
   (c) 3 (d) B = 3 x P – 3 (e) 42
4. (a) (i) £33 (ii) £38 (b) £5
   (c) C = 5 x D + 3 (d) £53
5. (a) 0·3 tonnes (b) W = 0·3 x T + 1·1
6. (a) C = 3 x N + 3 (b) A = 5 x B + 8
   (c) W = 4 x N + 46 (d) V = 7 x T + 12
   (e) T = 2 x D + 6·5 (f) D = 6 x T – 4
   (g) D = 11 x P – 6 (h) P = 15 x D + 78
7. (a) 3 (b) D = 3 x T + 29
   (c) 59 cm (d) 15 minutes

Answers to Chapter 17 - Probability

Ch 17 - Introductory Exercise - page 205

Variations in the answers might be expected here

1. E 2. I 3. ML 4. LL
5. C 6. E 7. LL 8. E
9. I 10. ML 11. C 12. I

Ch 17 - Exercise 1 - page 206

1. (a) $^2/_5$ (b) $^3/_5$
2. (a) 6 (b) $^1/_6$ (c) $^1/_6$
   (d) $^3/_6$ ($^1/_2$) (e) $^4/_6$ ($^2/_3$) (f) 0
3. (a) 52 (b) $^1/_2$ (c) $^1/_{13}$
   (d) $^3/_{13}$ (e) $^9/_{13}$ (f) $^1/_{52}$
4. (a) $^6/_{15}$ ($^2/_5$) (b) $^9/_{15}$ ($^3/_5$)
5. (a) $^4/_{20}$ ($^1/_5$) (b) $^{10}/_{20}$ ($^1/_2$) (c) $^{16}/_{20}$ ($^4/_5$)
   (d) $^{10}/_{20}$ ($^1/_2$) (e) 1 (f) 0
6. (a) $^8/_{16}$ ($^1/_2$) (b) $^8/_{16}$ ($^1/_2$) (c) $^1/_{16}$
   (d) $^4/_{16}$ ($^1/_4$) (e) $^9/_{16}$
7. (a) $^{20}/_{60}$ ($^1/_3$) (b) $^{25}/_{60}$ ($^5/_{12}$) (c) $^{15}/_{60}$ ($^1/_4$)
8. (a) $^1/_7$ (b) $^3/_7$
   (c) $^4/_7$ (d) $^2/_7$
9. $^5/_8$

Answers to Chapter 18 - Whole No's

Ch 18 - Exercise 1 - page 209

1. (a) 3 (b) 1 (c) 3
   (d) 2 (e) 1
2. (a) 3 (b) 3 (c) 4 (d) 3
   (e) 3 (f) 7 (g) 4 (h) 3
   (i) 2 (j) 7 (k) 4 (l) 2
   (m) 7 (n) 6 (o) 1 (p) 2
3. (a) 70 (b) 700 (c) 6000 (d) 60000
   (e) 4000 (f) 3000 (g) 8 (h) 0·05
   (i) 0·5 (j) 0·01 (k) 0·0006 (l) 40
4. (a) 610 (b) 5100 (c) 31000 (d)650000
   (e) 47 (f) 37 (g) 9·3 (h) 0·12
   (i) 0·59 (j) 0·0066 (k) 0·045 (l) 100
5. (a) 7650 (b) 55100 (c) 99800 (d)345000
   (e) 8·23 (f) 77·9 (g) 0·534 (h) 0·876
   (i) 0·00154 (j) 0·0107 (k) 0·0557 (l) 0·100
6. 3700 grams
7. 7180 ml
8. £39000
9. £261·70
10. (a) £259 (b) £15000 (c) £2460
11. £19000
12. 70 kg

Ch 18 - Exercise 2 - page 211

1. (a) 9000 (b) 60000 (c) 250000
   (d) 10000 (e) 4000 (f) 80000
   (g) 800000 (h) 540000 (i) 10
   (j) 10 (k) 200 (l) 20
2. (a) 8900 (b) 30000 (c) 690000
   (d) 2000000 (e) 500 (f) 1300
3. (a) 3700 (b) 4000 (c) 900
   (d) 20 (e) 10 (f) 90
4. (a) 10000 (b) 400
5. Exact answers to Questions 1-4 :-
1. (a) 9895 (b) 54675 (c) 273997
   (d) 12556 (e) 5945 (f) 80597
   (g) 930528 (h) 540792 (i) 9·89...
   (j) 12·04... (k) 211·99... (l) 22·13...
2. (a) 8819 (b) 30069 (c) 699704
   (d) 2181951 (e) 510·30... (f) 1277·83...
3. (a) 4281 (b) 2774 (c) 860·16...
   (d) 23·06 (e) 5·52... (f) 88·28...
4. (a) 10176 (b) 418

Answers to Chapter 19 - Decimals 2

Ch 19 - Exercise 1 - page 213

1. (a) 60 (b) 150 (c) 35 (d) 2
2. (a) 20 (b) 4 (c) 7·5 (d) 0·3
3. (a) 600 (b) 850 (c) 40 (d) 75
4. (a) 2 (b) 4·5 (c) 0·5 (d) 10
5. (a) 7000 (b) 2500 (c) 500 (d) 250
6. (a) 3 (b) 6·4 (c) 0·5 (d) 0·02
7. (a) 20 m (b) 15 m
8. 3·2 km
9. 5 mm
10. 7·5 m
11. 7·5 km

Ch 19 - Exercise 2 - page 215

1. (a) 500 cl (b) 350 cl (c) 20 cl
2. (a) 6 l (b) 15 l (c) 0·8 l
3. (a) 50 ml (b) 700 ml (c) 4 ml
4. (a) 40 cl (b) 9 cl (c) 0·5 cl
5. (a) 3000 ml (b) 35000 ml (c) 700 ml
6. (a) 8 l (b) 15 l (c) 3·5 l
7. (a) 1000 cm^3 and 80000 cm^3
   (b) 1 litre and 80 litres

Ch 19 - Exercise 3 - page 217

1. (a) 2000 g (b) 8000 g (c) 4200 g
2. (a) 5 g (b) 18 g (c) 0·4 g
3. (a) 2000 kg (b) 9000 kg (c) 6500 kg
4. (a) 2 kg (b) 0·5 kg (c) 17 kg
5. 1770 kg (1·77 tonnes)
6. 41·4 kg
7. 250
8. (a) 22000 g (b) 22 kg
9. (a) 1700 g (b) 1·7 kg

Answers to Chapter 20 - Percentages

Ch 20 - Exercise 1 - page 219

1. (a) $^1/_4$ (b) $^3/_{40}$ (c) $^7/_8$, $^1/_8$
   (d) $^1/_5$ (e) $^5/_7$ (f) (i) $^3/_8$, (ii) $^5/_8$
2. (a) 75% (b) 25% (c) 5% (d) 20%
   (e) 80% (f) 37·5% (g) 35% (h) 10%
   (i) 90% (j) 50% (k) 3% (l) 75%
3. 50%, 70%, 10%
4. Biology = 75%, Chemistry = 80% (Chemistry)
5. potatoes – 53%, carrots – 21%, lettuce – 10%,
   sprouts – 9%, beetroot – 7%
6. 40%
7. table tennis – 40%, badminton – 8%
   squash – 24%, archery – 28%
8. 2·5%
9. orange – 30%, cola – 40%,
   lemon – 14%, lime – 12%,
   blackcurrent – 4%
10. 5%

Ch 20 - Exercise 2 - page 221

1. (a) 20% (b) 25% (c) 50%
   (d) 10% (e) 400%
2. 90p -> 25%
3. £10 -> 25%
4. £2 -> 1%
5. 26·666...%
6. 25%
7. 20%
8. (a) loss (b) 15%

Ch 20 - Exercise 3 - page 223

1. (a) £2 (b) 25%
2. (a) £980 (b) 7%
3. (a) 1260 (b) 15%
4. 1·6%
5. 70%
6. 9°C -> 75%
7. (a) 70 (b) 58·3%

Answers to Chapter 21 - Enlargement

Ch 21 - Exercise 1 - page 225

1. (a) 8 (b) 100 (c) 6
   (d) 100 (e) 9 (f) 100
2. (a) 10 (b) 50 (c) 5
   (d) 30 (e) 10000 (f) 20
3. (a) 4 cm -> 40 cm (b) 2 cm -> 200 cm
   (c) 5 cm -> 50 cm (d) 2·5 cm -> 250 cm
   (e) 6·3 cm -> 6·3 m (f) 5·7 cm -> 5·7 km
4. (a) 6 cm (b) 300 cm
5. (a) 7 cm (b) 560 cm
6. (a) 6 cm (b) 720 cm
7. (a) (i) 150 cm (ii) 250 cm
   (iii) 350 cm (iv) 150 cm
   (b) 4 metres (400 cm)

Ch 21 - Exercise 2 - page 227

1. (a) 500 cm (5 m) (b) 2000 cm (20 m)
   (c) 1000 cm (10 m) (d) 3000 cm (30 m)
2. 150 cm (1·5 m)
3. (a) 2 (b) 17·6 cm
4. (a) 50 (b) (i) 7·5m (ii) 5·0 m
5. (a) 3 cm (b) 6 cm (c) 60 cm
   (d) 4 cm (e) 25 cm

6. 75 cm
7. 8 cm
8. 10 cm (0·1 m)
9. (a) $^1/_8$ (b) 1·5 cm
10. (a) 2·5 (b) 5 m
11. (a) 1·5 (b) 9 cm
12. (a) $^1/_3$ (b) 5 cm

Answers to Chapter 22 - Algebra 2

Ch 22 - Exercise 1 - page 232

1. (a) > (b) < (c) <
   (d) > (e) = (f) >
   (g) > (h) > (i) >
   (j) > (k) < (l) <
   (m) = (n) < (o) <
2. (a) 4,5 (b) 0,1 (c) 5
   (d) 0,1,2,3,4,5 (e) 0 (f) 1,2,3,4,5
   (g) 0,1,2,3 (h) - (i) 3,4,5
3. (a) 2,3 (b) -2,-1 (c) 0,1,2,3
   (d) -2,-1,0,1 (e) 2,3 (f) -2,-1,0
4. (a) 4,5 .... 10 (b) 3, 4 .... 10 (c) 1,2 6
   (d) 8,9,10 (e) 1,2 (f) 1,2,3,4
5. (a) $x > 2$ (b) $x > 5$ (c) $x \le 1$
   (d) $x < 3$ (e) $x > 5$ (f) $x \le 3{\cdot}5$
   (g) $x > 1$ (h) $x < 5$ (i) $x \ge 4$
   (j) $x \le 4$ (k) $x > 10$ (l) $x \le 6$
   (m) $x > 3{\cdot}5$ (n) $x < 1{\cdot}5$ (o) $x \le 5{\cdot}5$
   (p) $x > 3$ (q) $x < 2$ (r) $x \ge 5$

Answers to Chapter 23 - DST 2

Ch 23 - Exercise 1 - page 235

1. (a) 0·4
   (b) 0·6 (c) 0·1 (d) 0·9 (e) 0·35
   (f) 0·85 (g) 0·75 (h) 0·05 (i) 0·8
2. (a) 0·33 (b) 0·67 (c) 0·17 (d) 0·08
   (e) 0·83 (f) 0·07 (g) 0·58 (h) 0·92
3. (a) 2·6
   (b) 1·8 (c) 3·2 (d) 5·45 (e) 2·53
   (f) 1·9 (g) 6·05 (h) 5·17 (i) 4·67
4. 24 km
5. (a) 216 miles (b) 180 miles (c) 72 miles
   (d) 252 miles (e) 36 miles (f) 306 miles
6. (a) 64 km (b) 8 miles (c) 13·2 km
   (d) 15 miles (e) 300 miles (f) 21 miles
7. Billy - 60 km, Emma - 65 km
8. 84 km
9. (a) 975 km (b) 104 miles
   (c) 70 km (d) 11520 km
10. 100 km/hr
11. (a) 40 mph (b) 200 km/hr (c) 4 mph
    (d) 400 mph (e) 100 km/hr (f) 30 mph
    (g) 800 mph (h) 18 mph
12. (a) 60 km/hr (b) 1 hr 15 mins

Ch 23 - Exercise 2 - page 238

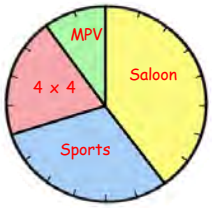
1. (a) 27 mins (b) 48 mins (c) 6 mins
   (d) 45 mins (e) 51 mins (f) 20 mins
2. (a) 1 hr 36 mins
   (b) 3 hrs 12 mns (c) 1 hr 21 mins
   (d) 4 hrs 18 mns (e) 1 hr 57 mins
   (f) 5 hrs 36 mns (g) 1 hr 40 mins
   (h) 0 hrs 10 mns (i) 2 hrs 39 mins
3. (a) 1·4 hrs (b) 1 hr 24 mins
4. (a) 3·2 hrs (b) 3 hrs 12 mins
5. (a) 3 hrs 18 min (b) 45 mins
   (c) 1 hr 21 min (d) 4 hrs 36 mins
6. (a) 3 hrs 6 mins (b) 54 mins
   (c) 2 hrs 39 mins

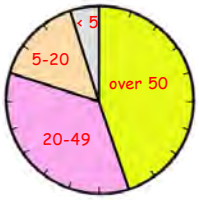
Answers to Chapter 24 - Statistics 2

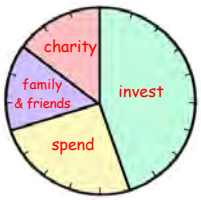
Ch 24 - Exercise 1 - page 241

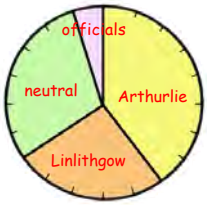
1. (a) Set A - mean = 11, Range = 16
   (b) Set B - mean = 14, Range = 5
   (c) Set A are a younger group but their ages are more spread out
2. (a) Means are 7 and 6
   Ranges are 14 and 6 - Various comments
   (b) Means are 19 and 5·5
   Ranges are 36 and 5 - Various comments
   (c) Means are 138 and 111
   Ranges are 62 and 30 - Various comments
   (d) Means are 8·5 and 11·4
   Ranges are 5·2 and 16·3 - Various comments
3. Jeff - Mean £7 - Range £10
   Sara - Mean £7 - Range £2 - see comments
4. (a) Scotland - £9·12, America - £4·75
   (b) £4·37 cheaper
   (c) Ranges are Scotland - £3·08, USA - 45p
   Cheaper in Am,erica, but in Scotland if you shop around there is a wider range of prices.
5. (a) No - Mean of this sample is 13
   (b) Mean no. per box = 13
   (c) 23
6. (a) mean-8, median-6, mode-6, range -18
   (b) mean-9, median-7, mode-4, range-14
   (c) mean-6·4, median-6·3, mode-6·3, range-7·8
   (d) mean-75·5, median-67·5, mode-111, range -70
   (e) mean-3·6, median-3·2, mode-3·2, range -6·3
   (f) mean-0, median-0, mode-0, range -9
7. (a) mean - 38·5, median - 30·5, mode - no mode
   (b) mean - 12·9, median - 12, mode - no mode
8. (a) mean - 30·5, median - 17, mode - 1
   (b) median shows better indication of the middle
9. (a) mean - 24, median - 12·5, mode - 11
   median - forgetting 75, shows middle better
   (b) mean - 1·2, median - 1·35, mode 2·0
   mean is probably better average
10. Except for the 2 "extremes" which may be rogue values, all the other scores are the same.
11. All may be correct since mean = £12700, median = £12500 and mode = £14000
12. 20

Ch 24 - Exercise 2 - page 244

1. (a) (i) - $^3/_{10}$ (ii) - $^2/_{10}$ (iii) - $^1/_{10}$ (iv) - $^4/_{10}$
   (b) puppy - kitten - fish - rodent
   (c) (i) 60 (ii) 30 (iii) 90 (iv) 120
2. (a) 5%
   (b) Cod - 45%, Salmon - 20%,
   Haddock - 25%, Trout - 10%
   (c) (i) 1000 (ii) 800 (iii) 1800 (iv) 400
3. (a) $^1/_4$
   (b) (i) $^1/_8$ (ii) $^1/_6$ (iii) $^1/_{12}$ (iv) $^3/_8$
   (c) (i) 6 (ii) 2 (iii) 4 (iv) 3
   (d) 9
4. 

5. (a) 5% (b)


6. 

7. 

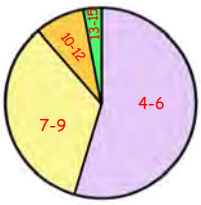
Ch 24 - Exercise 3 - page 246

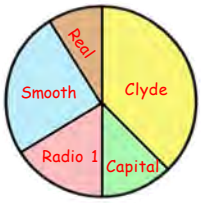
1. (a) 180°, 120°, 40°, 20°
   (b)


2. (a) 24°, 168°, 136°, 32°
   (b)


3. (a) 84°, 48°, 72°, 156°
   (b)


4. (a) 160°, 120°, 15°, 65° (b) 190°, 130°, 30°, 10°

5. (a) Angles in order - 135°, 45°, 54°, 90°, 36°
   (b)


Ch 24 - Exercise 4 - page 248

1. (a) £20 (b) £80 (c) £120 (d) £220
   (e) £30 (f) £70 (g) £190
2. (a) (i) 900 m (ii) 700 m
   (b) (i) 850 m (ii) 650 m (c) 100 seconds

3. (a) £50
   (b) (i) £75 (ii) £100
   (c) (i) £125 (ii) £137·50
   (iii) £62·50 (iv) £187·50
4. (a) (i) 103°F (ii) 97°F (iii) 98°F
   (b) (i) 97·5°F (ii) 100·25°F (100·0-100·5)
   (c) (i) Approx 102-103°C if pattern continues
   (ii) Approx 97°C if medicine works
5. (a) (i) 20°C (ii) 24°C (iii) 22°C
   (b) (i) about 13°C-14°C (ii) about 11°C-14°C

Answers to Chapter 25 - Pythagoras

Ch 25 - Exercise 1 - page 254

1. 15 cm
2. (a) 13·2 cm (b) 7·55 cm
   (c) 15·0 mm (d) 3·95 m
3. 5·29 m
4. 40·3 m
5. 9·64 cm
6. 19·6 m
7. (a) 15 cm (b) 31·6 cm
8. 3·39 m
9. 38·4 cm

Ch 25 - Exercise 2 - page 257

1. (a) P(2, 3) Q(8, 6)
   (b)/(c)/(d) – 6·7 boxes
2. (a) L(2, 1) M(6, 7)
   (b)/(c)/(d)/ – 7·2 boxes
3. (a) E(3, 46) F(9, 2)
   (b)/(c)/(d)/ – 7·2 boxes
4. (a)/(b)/(c) check drawings (d) 6·7 boxes
5. (a)/(b) check drawings (c) 8·5 boxes
6. (a)/(c) check drawings (b) 5
   (d) 5 (e) isosceles triangle

Ch 25 - Exercise 3 - page 258

1. (a) 10·3 cm (b) 13·3 cm (c) 8·9 m
   (d) 13·9 mm (e) 48·3 cm (f) 2·48 m
2. x should be smaller than 10
3. 17·9 cm (21·9 is bigger than 20 !)
4. 5·64 m
5. 18·4 cm
6. 16·0 ft
7. 6 metres
8. (a) 24 ft (b) 20 ft (c) 4 ft
9 2400 metres

Answers to Chapter 26 - Area 2

Ch 26 - Exercise 1 - page 262

1. (a)/(b)/(c) check drawings
   (d) (7 by 4) cm (e) 28 cm^2 (f) 28 cm^2
2. (a) 16 cm^2 (b)/(c) check drawings
3. 40 cm^2
4. (a) 48 cm^2 (b) 105 cm^2 (c) 187 cm^2
   (d) 42 m^2 (e) 13·8 cm^2 (f) 1080 mm^2
   (g) 72 cm^2 (h) 64 m^2 (i) 3600 m^2
5. 330 cm^2
6 5270 m^2
7. (a) parallelogram (b) 60 m^2 – 54 m^2 = 6m^2
8. 5 cm
9. (a) 6 cm (b) 10 cm (c) 13 cm
10. (a) 10 cm (b) 9 cm
    (c) 90 cm^2 (d) 1080 cm^2

Ch 26 - Exercise 2 - page 265

1. (a)/b check drawings
   (c) 24 cm^2 (d) 12 cm^2
2. (a)/(b) see drawings
   (c) 70 cm^2 (d) 35 cm^2
3. (a) 18 cm^2 (b) 120 cm^2 (c) 88 cm^2
   (d) 63 cm^2 (e) 50 cm^2 (f) 45 cm^2
4. (a) see drawing (b) 24 cm^2 (c) 12 cm^2
5. (a) see drawing (b) 72 cm^2 (c) 36 cm^2
6. (a) 27 cm^2 (b) 30 cm^2 (c) 110 cm^2
   d 34 cm^2 (e) 1600 mm^2 (f) 68 cm^2
7 Both the same area (30 cm^2)

Ch 26 - Exercise 3 - page 268

1. (a)/(b) check drawings
   (c) 15 cm^2 and 25 cm^2 (d) 40 cm^2
2. (a)/(b) check drawings
   (c) 27 cm^2 and 36 cm^2 (d) 63 cm^2
3. (a) 28 cm^2 (b) 85 cm^2 (c) 210 cm^2
   (d) 3500 cm^2 (e) 25 cm^2

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Book N4-1