N5 UNIT 2

Past Paper Assessment Revision
National 5 Mathematics
Unit 2

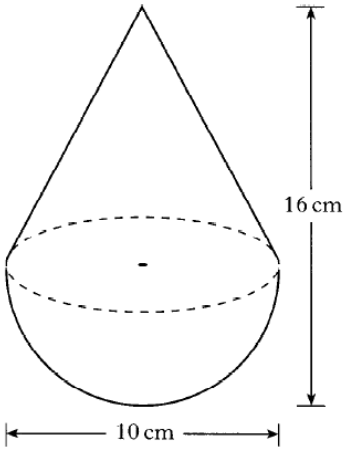
VOLUME AND SURFACE AREA

A child's toy is in the shape of a hemisphere with a cone on top, as shown in the diagram.

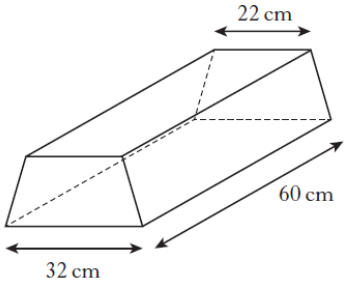
The toy is 10 centimetres wide and 16 centimetres high.

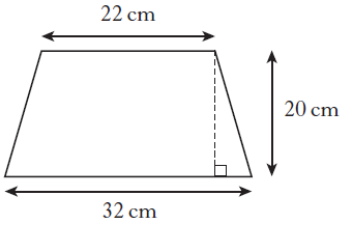
Calculate the volume of the toy.

Give your answer correct to 2 significant figures.



3. A concrete block is in the shape of a prism.



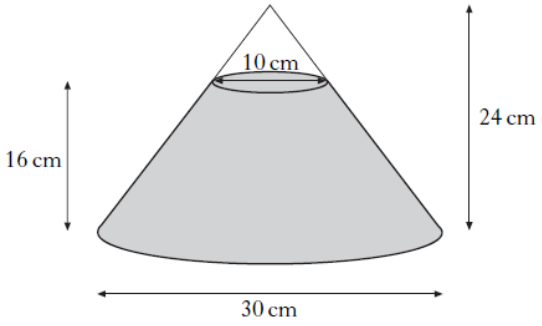


The cross section of the prism is a trapezium with dimensions as shown.

(*a*) Calculate the area of the cross section.

(*b*) Calculate the volume of the concrete block.

A glass ornament in the shape of a cone is partly filled with coloured water.



The cone is 24 centimetres high and has a base of diameter 30 centimetres.

The water is 16 centimetres deep and measures 10 centimetres across the top.

What is the volume of the water?

Give your answer correct to 2 significant figures.

The Battle of Largs in 1263 is commemorated by a monument known as The Pencil.

This monument is in the shape of a cylinder with a cone on top.

The cylinder part has diameter 3 metres and height 15 metres.

(*a*) Calculate the volume of the **cylinder** part of The Pencil.

The volume of the **cone** part of The Pencil is 5·7 cubic metres.

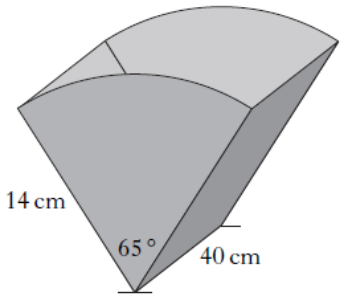
(*b*) Calculate the **total** height of The Pencil.

The ends of a magazine rack are identical.

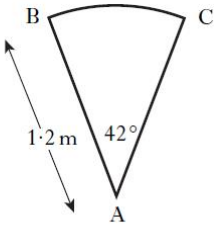
Each end is a sector of a circle with radius 14 centimetres.
The angle in each sector is 65 °.

The sectors are joined by two rectangles, each with length 40 centimetres.

The exterior is covered by material.
What area of material is required?



A spiral staircase is being designed.



Each step is made from a sector of a circle as shown.

The radius is 1·2 metres.

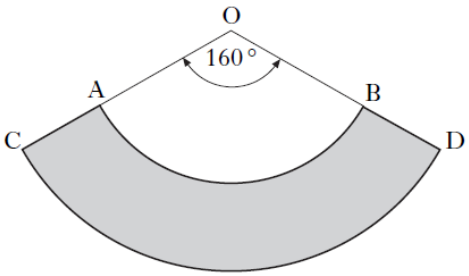
Angle BAC is 42°.

For the staircase to pass safety regulations, the arc BC must be at least 0·9 metres.

Will the staircase pass safety regulations?

A pet shop manufactures protective dog collars.

In the diagram below the shaded area represents one of these collars.



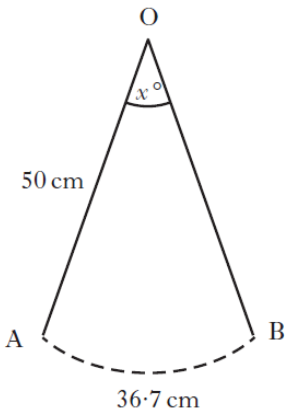
AB and CD are arcs of the circles with centres at O.

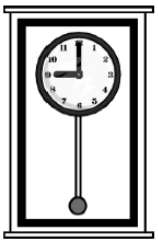
The radius, OA, is 10 inches and the radius, OC, is 18 inches.

Angle AOB is 160°.

Calculate the area of a collar.

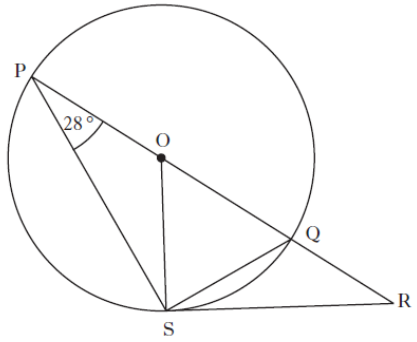
As the pendulum of a clock swings, its tip moves through an arc of a circle.





The length of the pendulum is 50 centimetres.
The length of the arc is 36·7 centimetres.

Calculate $x°$, the angle through which the pendulum swings.

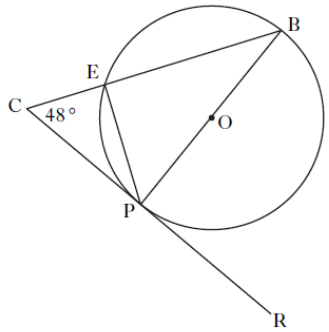


In the above diagram,

- O is the centre of the circle
- PQ is a diameter of the circle
- PQR is a straight line
- RS is a tangent to the circle at S
- angle OPS is 28°.

Calculate the size of angle QRS.

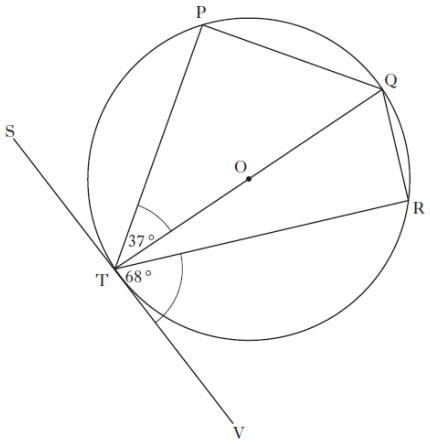
A circle, centre O, is shown below.



In the circle

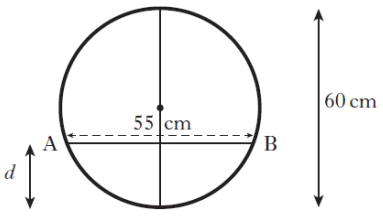
- PB is a diameter
- CR is a tangent to the circle at point P
- Angle BCP is 48°.

Calculate the size of angle EPR.



The tangent SV touches the circle, centre O, at T.
Angle PTQ is 37° and angle VTR is 68°.
Calculate the size of angle PQR.

Water flows through a horizontal pipe of diameter 60 centimetres.
The surface width, AB, of the water is 55 centimetres.

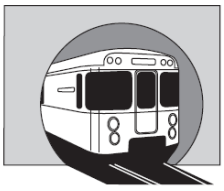


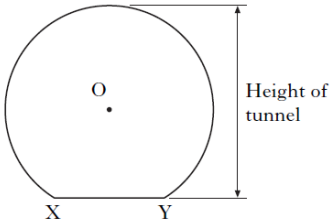
(*a*) Calculate the depth, *d*, of the water in the pipe.

(*b*) What other depth of water would give the same surface width?

A railway goes through an underground tunnel.

The diagram below shows the cross-section of the tunnel. It consists of part of a circle with a horizontal base.



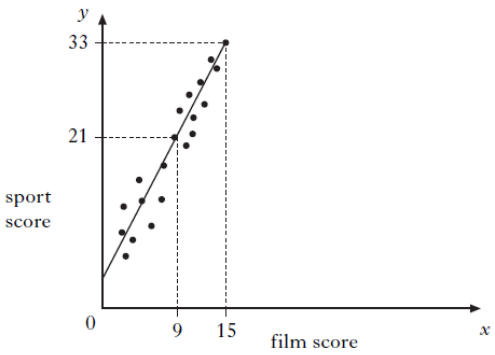


- The centre of the circle is O.
- XY is a chord of the circle.
- XY is 1·8 metres.
- The radius of the circle is 1·7 metres.

Find the height of the tunnel.

Teams in a quiz answer questions on film and sport.

This scatter graph shows the scores of some of the teams.



A line of best fit is drawn as shown above.

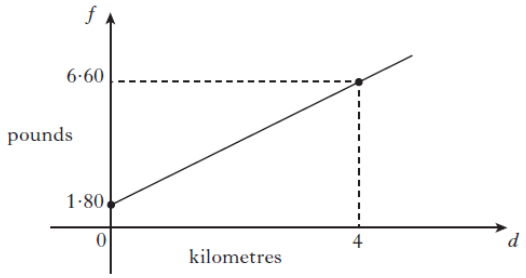
(*a*) Find the equation of this straight line.

(*b*) Use this equation to estimate the sport score for a team with a film score of 20.

A taxi fare consists of a call-out charge of £1·80 **plus** a fixed cost per kilometre.

A journey of 4 kilometres costs £6·60.

The straight line graph shows the fare, *f* pounds, for a journey of *d* kilometres.

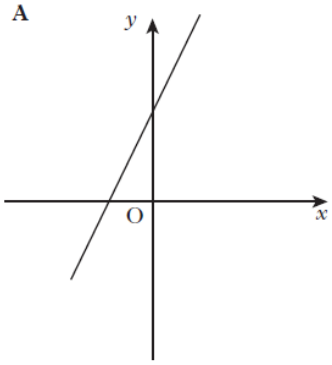


(*a*) Find the equation of the straight line.

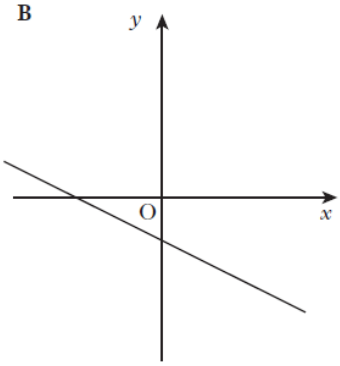
(*b*) Calculate the fare for a journey of 7 kilometres.

Four straight line graphs are shown below.

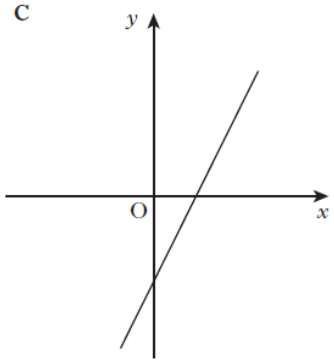
A



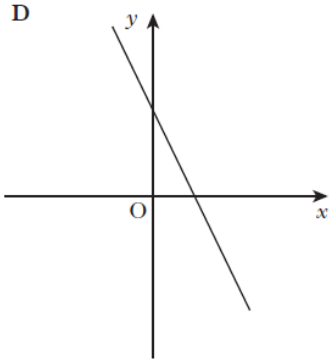
B



C



D



Which one of these above could represent the line with equation $2x + y = 3$?

Give two reasons to justify your answer.

Solve the inequality

$$4x - 5 \leq 7x - 20.$$

Solve algebraically the inequality

$$11 - 2(1 + 3x) < 39$$

Solve the equation

$$3x + 1 = \frac{x - 5}{2}.$$

Solve the inequality

$$\frac{x}{4} - \frac{1}{2} < 5.$$

SIMULTANEOUS EQUATIONS

(*a*) A cinema has 300 seats which are either standard or deluxe.

Let x be the number of standard seats and y be the number of deluxe seats.

Write down an algebraic expression to illustrate this information.

(*b*) A standard seat costs £4 and a deluxe seat costs £6.

When all the seats are sold the ticket sales are £1380.

Write down an algebraic expression to illustrate this information.

(*c*) How many standard seats and how many deluxe seats are in the cinema?

Two groups of people go to a theatre.

Bill buys tickets for 5 adults and 3 children.

The total cost of his tickets is £158·25.

(a) Write down an equation to illustrate this information.

(b) Ben buys tickets for 3 adults and 2 children.

The total cost of his tickets is £98.

Write down an equation to illustrate this information.

(c) Calculate the cost of a ticket for an adult and the cost of a ticket for a child.

A straight line has equation $y = mx + c$, where m and c are constants.

(*a*) The point (2, 7) lies on this line.

Write down an equation in m and c to illustrate this information.

(*b*) A second point (4, 17) also lies on this line.

Write down another equation in m and c to illustrate this information.

(*c*) Hence calculate the values of m and c.

(*d*) Write down the gradient of this line.

FORMULAE

Change the subject of the formula to r.

$$A = 4\pi r^2.$$

Change the subject of the formula to m.

$$L = \frac{\sqrt{m}}{k}$$

Change the subject of the formula to s.

$$t = \frac{7s+4}{2}.$$

Change the subject of the formula $p = \frac{mv^2}{2}$ to v.

Change the subject of the formula $s = ut + \frac{1}{2}at^2$ to a.

$$P = \frac{2(m-4)}{3}$$

Change the subject of the formula to m.

A group of people attended a course to help them stop smoking.

The following table shows the statistics before and after the course.

	Mean number of cigarettes smoked per person per day	*Standard deviation*
Before	20·8	8·5
After	9·6	12·0

Make **two** valid comments about these results.

A machine is used to put drawing pins into boxes.

A sample of 8 boxes is taken and the number of drawing pins in each is counted.

The results are shown below:

102 102 101 98 99 101 103 102

(*a*) Calculate the mean and standard deviation of this sample.

(*b*) A sample of 8 boxes is taken from another machine.

This sample has a mean of 103 and a standard deviation of 2·1.

Write down two valid comparisons between the samples.

Tom looked at the cost of 10 different flights to New York.

He calculated that the mean cost was £360 and the standard deviation was £74.

A tax of £12 is then added to each flight

Write down the new mean and standard deviation.

Ten couples took part in a dance competition.

The couples were given a score in each round.

The scores in the first round were

16 27 12 18 26 21 27 22 18 17

(a) Calculate the median and semi-interquartile range of these scores.

(b) In the second round, the median was 26 and the semi-interquartile range was 2·5.

Make two valid comparisons between the scores in the first and second rounds.