N5

Paper B
Non Calculator

Units 1 - 3

FORMULAE LIST

The roots of $ax^2 + bx + c = 0$ are $x = \dfrac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Sine rule: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$ or $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle: $A = \frac{1}{2}ab\sin C$

Volume of a sphere: $V = \frac{4}{3}\pi r^3$

Volume of a cone: $V = \frac{1}{3}\pi r^2 h$

Volume of a pyramid: $V = \frac{1}{3}Ah$

Standard deviation: $s = \sqrt{\dfrac{\Sigma(x - \bar{x})^2}{n - 1}} = \sqrt{\dfrac{\Sigma x^2 - (\Sigma x)^2 / n}{n - 1}}$, where n is the sample size.

1. Simplify $3(2x-4)-4(3x+1)$ **3**

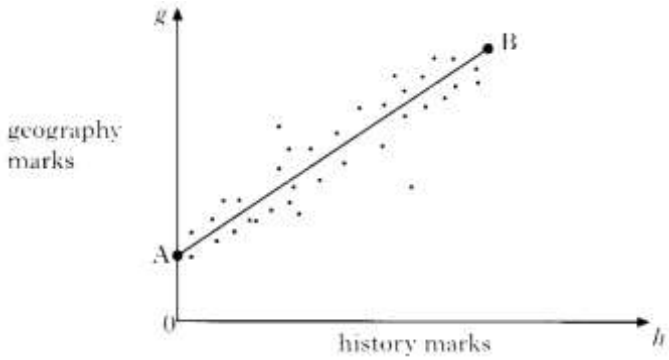
2. Factorise $3x^2-5x-2$ **2**

3. Evaluate $1\frac{5}{8}\div\frac{3}{4}$ **2**

4. Solve algebraically the inequality

$$5x-4<2(1-2x)$$ **3**

5. The graph below shows the relationship between the history and geography marks of a class of students.



A best-fitting straight line, AB has been drawn.

Point A represents 0 marks for history and 12 marks for geography.
Point B represents 90 marks for history and 82 marks for geography.

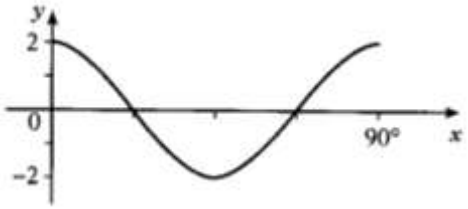
Find the equation of the straight line AB in terms of h and g. **3**

6. $f(x)=3^x$

Find $f(4)$. **2**

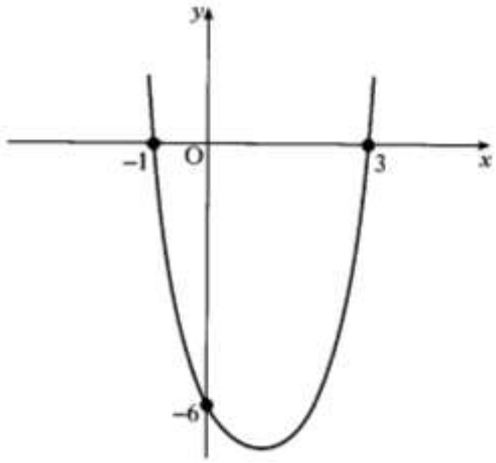
7. If $\underline{a}=\begin{pmatrix}2\\4\\5\end{pmatrix}$ and $\underline{b}=\begin{pmatrix}-4\\2\\0\end{pmatrix}$, calculate $3\underline{a}+2\underline{b}$ **2**

8. The graph of $y=acosbx$, $0\le x\le 90$, is shown below.



Write down the values of a and b. **2**

9. The diagram below shows part of the graph of a quadratic function, with equation of the form $y = k(x - a)(x - b)$.



The graph cuts the y-axis at (0, -6) and the x-axis at (-1, 0) and (3, 0)

(a) Write down the values of a and b. **2**

(b) Calculate the value of k. **2**

(c) Find the coordinates of the minimum turning point of the function. **2**

10. Given that

$$cos60° = 0.5$$

What is the value of $cos240°$? **1**

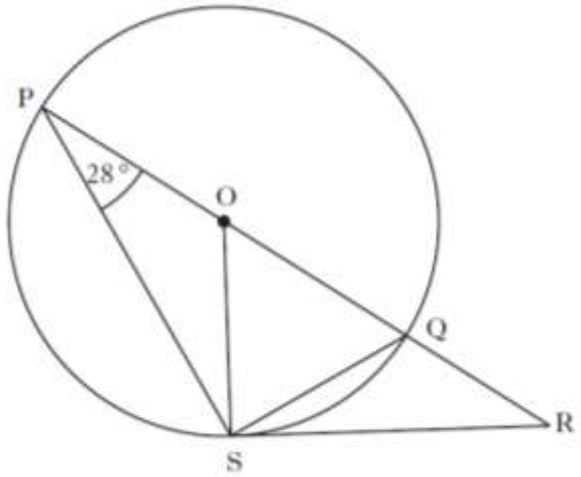
11. The tickets for a Sports club disco cost £2 for members and £3 for non-members.

(a) The total ticket money collected was £580.
x tickets were sold to members and y tickets were sold to non-members.
Use this information to write down an equation involving x and y. **1**

(b) 250 people bought tickets for the disco.
Write down another equation involving x and y. **1**

(c) How many tickets were sold to members? **4**

12.



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^o.

Calculate the size of angle QRS. **3**

13. A straight line has equation $4x + 3y = 12$

(a) Find the gradient of this line. **2**

(b) Find the coordinates of the point where this line crosses the x-axis. **2**

14. Prove that

$$\frac{sin^2A}{1-sin^2A} = tan^2A$$

2

15.

figure 1

A gardener creates an l-shaped flower-bed. He uses the house walls and concrete edging for the boundary as shown in figure 1.

He plans his flower-bed as shown in figure 2.

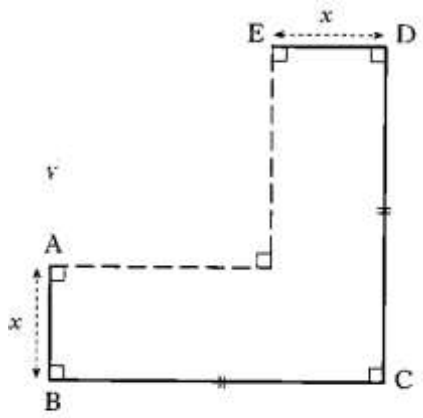


figure 2

(a) He uses a total of 6 metres of edging.
AB = ED = x metres
BC = DC
Show that the length, in metres, of BC can be expressed as BC = 3 – x. **2**

(b) Hence show that the area, A, in square metres, of the flower-bed can be expressed as **3**

$$A = 6x - 3x^2$$

(c) Calculate algebraicallly the maximum area of the flower bed. **3**

N5

Paper B
Calculator

Units 1 - 3

1. Write $x^2 + 14x - 9$ in the form $(x + p)^2 + q$.

2

2. A microwave oven is sold for £150.
This price includes VAT at 17.5%
Calculate the price of the microwave oven without VAT.

3

3. Calculate the magnitude of $\underline{v}$ if $\underline{v} = \begin{pmatrix} 5 \\ -3 \\ 4 \end{pmatrix}$.

2

4. Fiona checks out the price of a litre of milk in several shops.
The prices in pence are:

49 44 41 52 47 43

(a) Find the mean price of a litre of milk. **1**
(b) Find the standard deviation of the prices. **3**
(c) Fiona also checks out the price of a kilogram of sugar in the same shops and finds that the standard deviation of the prices is 2.6.
Make one valid comparison between the two sets of prices. **1**

5. $$Q = p^2 + 3T$$
Change the subject of the formula to *T*.

2

6. Solve algebraically the equation
$$2 + 3sinx = 0 \quad \text{for} \quad 0 \leq x \leq 360$$

3

7. In 2017, a house was valued at £90 000 and the contents were valued at £60 000.

The value of the house appreciates by 5% each year.
The value of the contents depreciates by 8% per year.

What will be the total value of the house and the contents in 2020?

3

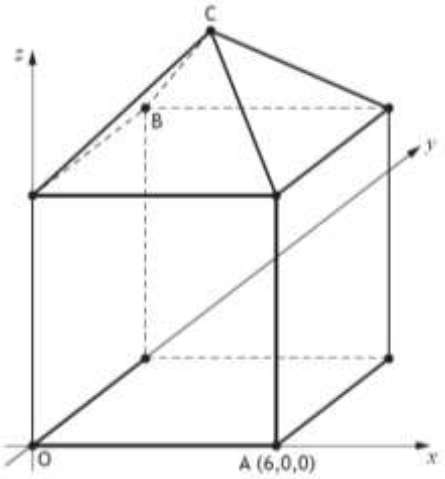
8. A cylindrical soft drinks can is 15 centimetres in height and 6.5 centimetres in diameter.

A new cylindrical can holds the same volume but has reduced height of 12 centimetres.

What is the diameter of the new can?
Give your answer to 1 decimal place.

4

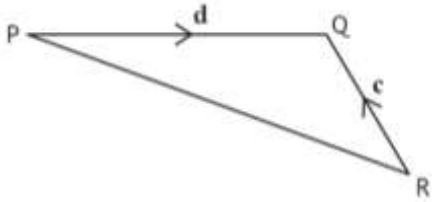
9. The diagram shows a square-based pyramid placed on top of a cube, relative to the coordinate axes.



The height of the pyramid is half the height of the cube.
A is the point (6, 0, 0).
The point C is directly above the centre of the base.
Write down the coordinates of B and C.

2

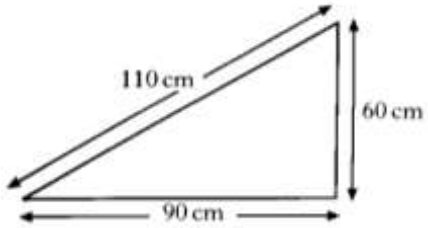
10. In the diagram below, $\overrightarrow{RQ}$ and $\overrightarrow{PQ}$ represent vectors $\underline{c}$ and $\underline{d}$ respectively.



Express $\overrightarrow{PR}$ in terms of $\underline{c}$ and $\underline{d}$.

1

11. A triangular paving slab has measurements as shown.



Is the slab in the shape of a right angled triangle?
Show your working.

3

12. Figure 1 shows a road bridge.

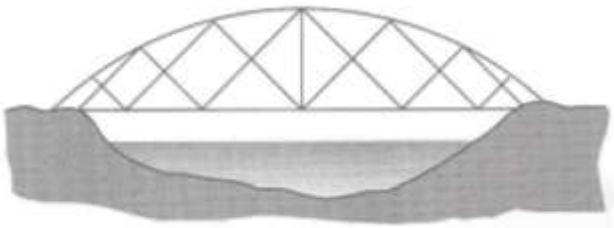


figure 1

The curved part of the bridge is formed from an arc of a circle, centre O, as shown in figure 2.

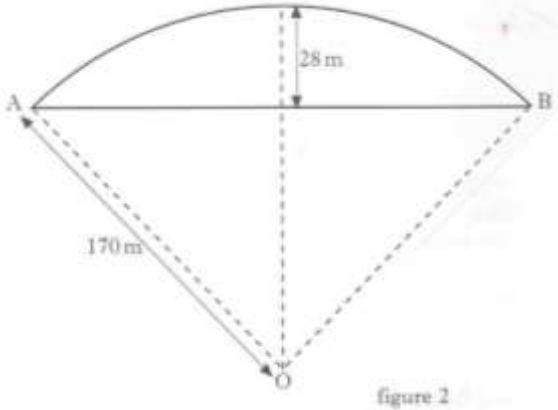


figure 2

OA and OB are radii of length 170 metres.
The height of the middle of the bridge above its ends is 28 metres as shown in figure 2.
Calculate the horizontal distance, AB.
Do not use a scale drawing.

4

13. 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.

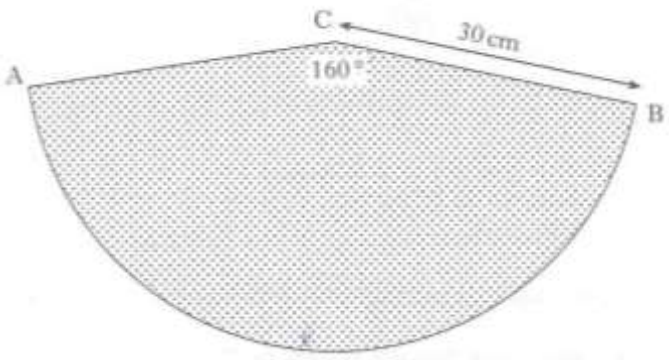
The cylinder part has diameter 3 metres and height 15 metres.

(a) Calculate the volume of the cylinder part of The Pencil. **2**

The volume of the cone part of The Pencil is 5.7 cubic metres.

(b) Calculate the total height of The Pencil. **3**

14.



The diagram shows a sector of a circle, centre C.
Angle ACB is 160° and the radius of the circle is 30cm.
Calculate the length of the arc.

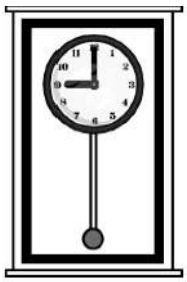
3

15. Solve algebraically the equation

$$\frac{x}{2} - \frac{x+1}{3} = 4$$

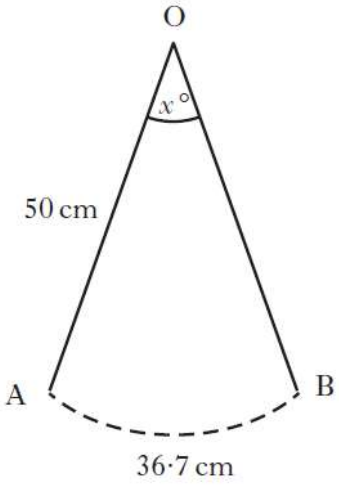
3

16. 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.



3