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National Qualifications
SPECIMEN ONLY

Mark

S847/75/02

Mathematics
Paper 2

Date — Not applicable

Duration — 1 hour 50 minutes

S8477502

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day | Month | Year

Scottish candidate number

Total marks — 60

Attempt ALL questions.

You may use a calculator.

To earn full marks you must show your working in your answers.

State the units for your answer where appropriate.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting.

Use **blue** or **black** ink.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.

SQA ©

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: $s = \sqrt{\dfrac{\Sigma(x - \bar{x})^2}{n - 1}}$

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

Total marks — 60

Attempt ALL questions

1. Beth normally cycles a total distance of 64 miles per week.
She increases her total distance by 15% each week for the next three weeks.
How many miles does she cycle in the third week? **3**
Give your answer to the nearest mile.

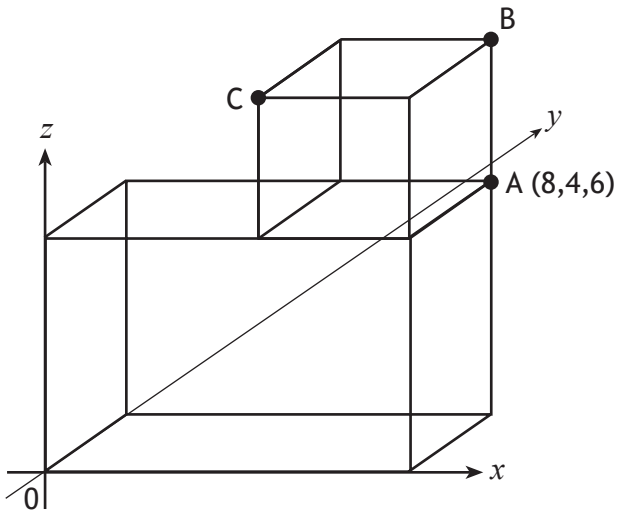
2. There are 3×10^5 platelets per millilitre of blood.
On average, a person has 5·5 litres of blood.
On average, how many platelets does a person have in their blood?
Give your answer in scientific notation. **2**

3. Expand and simplify

$$(2x+3)(x^2-4x+1).$$

3

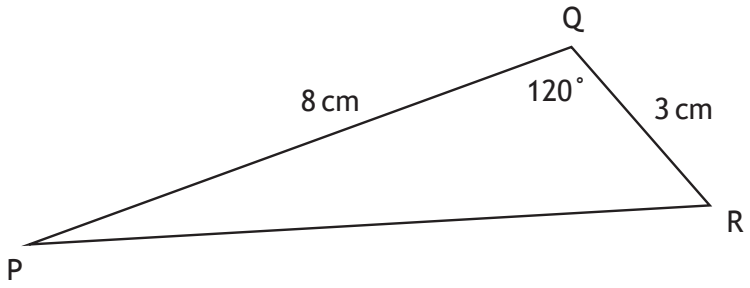
4. The diagram shows a cube placed on top of a cuboid, relative to the coordinate axes.



A is the point (8,4,6).

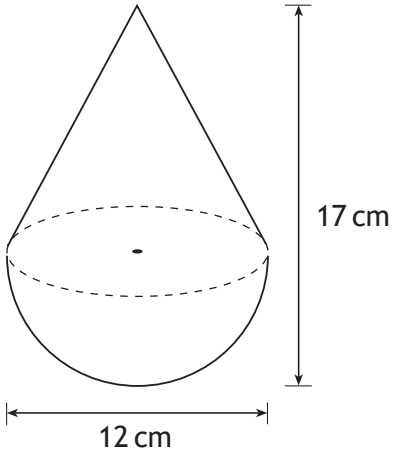
Write down the coordinates of B and C. **2**

5. In triangle PQR, PQ = 8 centimetres, QR = 3 centimetres and angle PQR = 120°.



Calculate the length of PR. **3**

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

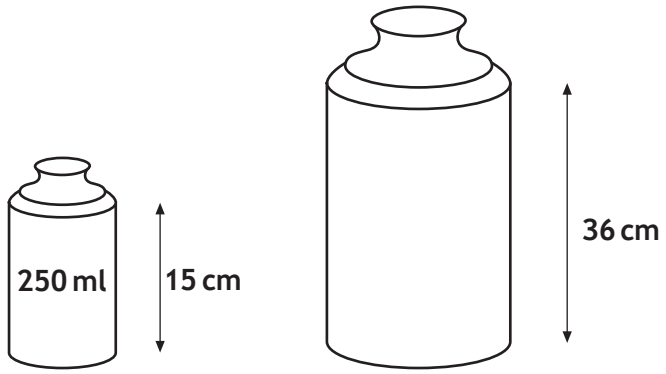


The toy is 12 centimetres wide and 17 centimetres high.

Calculate the volume of the toy.

Give your answer correct to 2 significant figures. **5**

7. Screenwash is available in bottles which are mathematically similar.



The smaller bottle has a height of 15 centimetres and a volume of 250 millilitres.

The larger bottle has a height of 36 centimetres.

Calculate the volume of the larger bottle. **3**

MARKS | DO NOT WRITE IN THIS MARGIN

8. Simplify $\frac{n^5 \times 10n}{2n^2}$. **3**

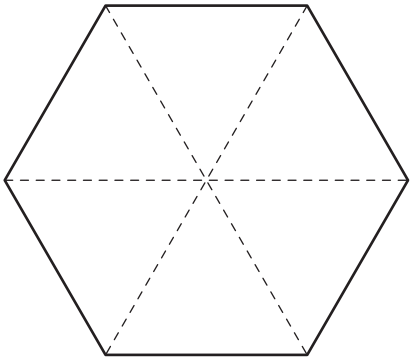
9. (a) A straight line has equation $4x + 3y = 12$.

Find the gradient of this line. **2**

(b) State the coordinates of the point where the line crosses the y-axis. **1**

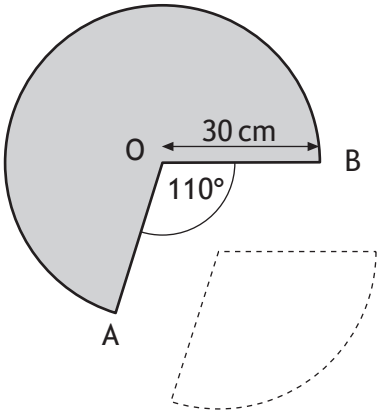
10. The top of a table is in the shape of a regular hexagon.

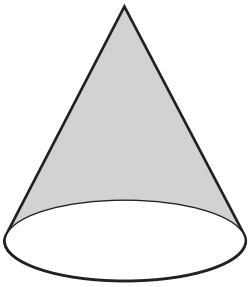
The three diagonals of the hexagon, which are shown as dotted lines in the diagram below, each have length 40 centimetres.



Calculate the area of the top of the table. **4**

11. A cone is formed from a paper circle with a sector removed as shown.
The radius of the paper circle is 30 centimetres.
Angle AOB is 110°.

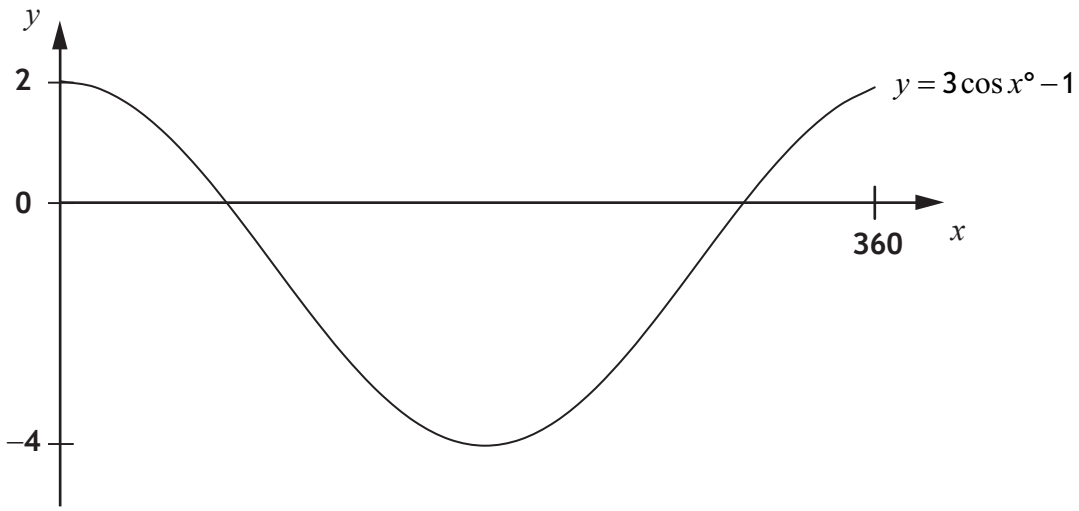




(a) Calculate the area of the sector removed from the circle. **3**

(b) Calculate the circumference of the base of the cone. **3**

12. Part of the graph $y = 3\cos x° - 1$ is shown below.



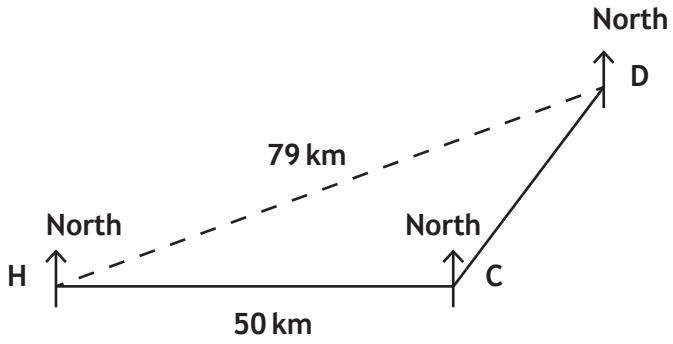
Calculate the x-coordinates of the points where the graph cuts the x-axis. **4**

MARKS | DO NOT WRITE IN THIS MARGIN

13. Simplify $\frac{x^2-4x}{x^2+x-20}$. **3**

14. Change the subject of the formula $s = ut + \frac{1}{2}at^2$ to a. **3**

15. A yacht sails from a harbour H to a point C, then to a point D as shown below.



C is 50 kilometres due east of H.

D is on a bearing of 040° from C and is 79 kilometres from H.

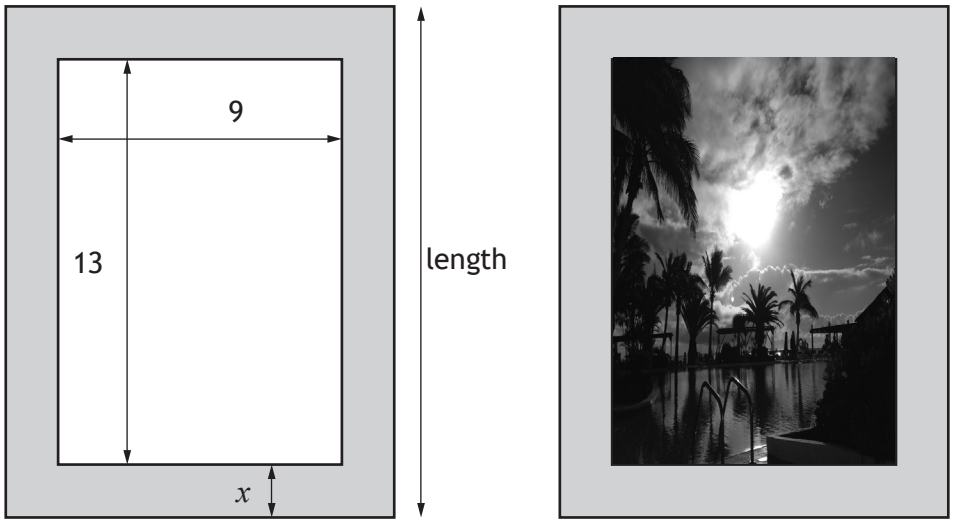
(a) Calculate the size of angle CDH. **4**

(b) Hence, calculate the bearing on which the yacht must sail to return directly to the harbour. **2**

16. A rectangular picture measuring 9 centimetres by 13 centimetres is placed on a rectangular piece of card.

The area of the card is 270 square centimetres.

There is a border x centimetres wide on all sides of the picture.



(a) (i) Write down an expression for the length of the card in terms of x. **1**

(ii) Hence show that $4x^2 + 44x - 153 = 0$. **2**

16. (continued)

(b) Calculate x, the width of the border.

Give your answer correct to one decimal place. **4**

[END OF SPECIMEN QUESTION PAPER]