



FOR OFFICIAL USE

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National
Qualifications
SPECIMEN ONLY

Mark

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S847/75/02**Mathematics
Paper 2**

Date — Not applicable

Duration — 1 hour 30 minutes



* S 8 4 7 7 5 0 2 *

Fill in these boxes and read what is printed below.

Full name of centre

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Town

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Forename(s)

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Surname

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Number of seat

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Date of birth

Day

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Month

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Year

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Scottish candidate number

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Total marks — 50

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.



* S 8 4 7 7 5 0 2 0 1 *

FORMULAE LIST

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

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

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

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

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



Total marks — 50
Attempt ALL questions

- Households in a city produced a total of 125 000 tonnes of waste in 2017.
The total amount of waste is expected to fall by 2% each year.
Calculate the total amount of waste these households are expected to produce in 2020.

3



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

3

3. Factorise fully $3x^2 - 48$.

2



* S 8 4 7 7 5 0 2 0 4 *

4. A school netball team recorded the number of sit-ups each player completed in a minute.

The numbers for the seven players were:

29 27 24 31 22 19 30

- (a) Calculate the mean and standard deviation of the numbers of sit-ups.

4



4. (continued)

Some players in the school's hockey team also recorded the number of sit-ups they completed in a minute.

Their numbers gave a mean of 29 and a standard deviation of 3.2.

- (b) Make two valid comments comparing the numbers of sit-ups of the players in the netball team and the hockey team.

2

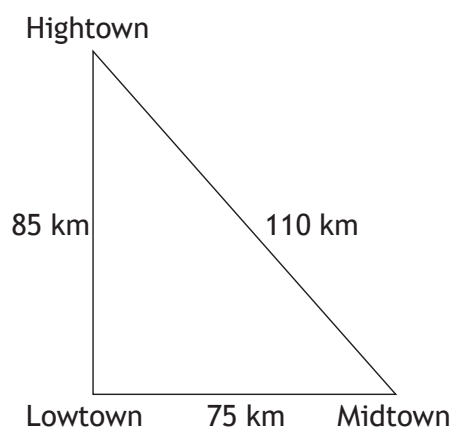


5. The diagram below shows the position of three towns.

Lowtown is due west of Midtown.

The distance from:

- Lowtown to Midtown is 75 kilometres
- Midtown to Hightown is 110 kilometres
- Hightown to Lowtown is 85 kilometres.



Is Hightown directly north of Lowtown?

Justify your answer.

4



6. A theatre group sold 4830 tickets for their show.
This was 15% more than they sold last year.
How many tickets did they sell last year?

3

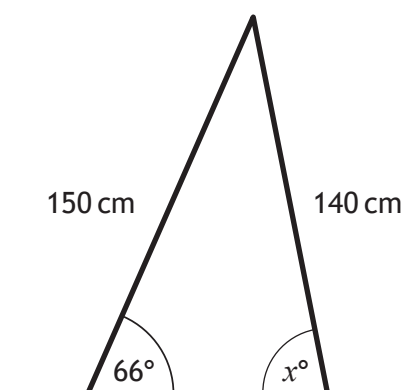


* S 8 4 7 7 5 0 2 0 8 *

7. A set of stepladders has legs 150 centimetres and 140 centimetres long.



When the stepladder is fully open, the angle between the longer leg and the ground is 66° .

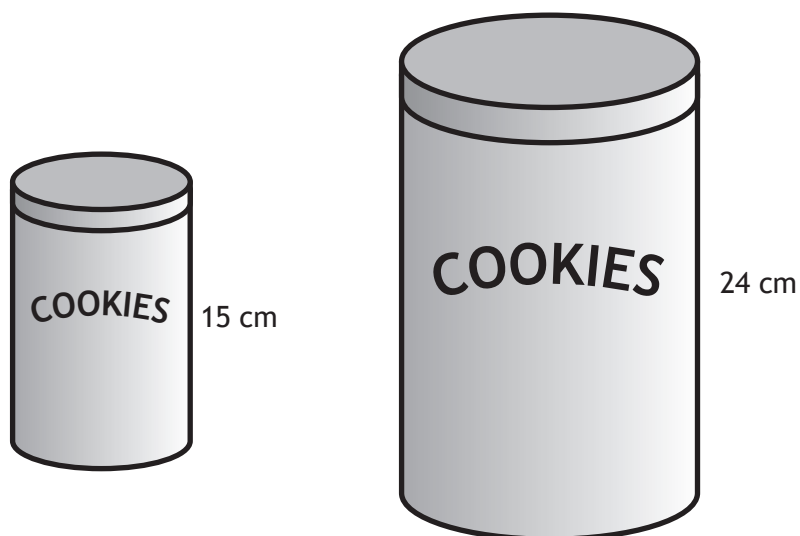


Calculate x° , the size of the angle between the shorter leg and the ground.

3



8. A supermarket sells cylindrical cookie jars which are mathematically similar.



The smaller jar has a height of 15 centimetres and a volume of 750 cubic centimetres.

The larger jar has a height of 24 centimetres.

Calculate the volume of the larger jar.

3

9. Solve the equation $11\cos x^\circ - 2 = 3$, for $0 \leq x \leq 360$.

3

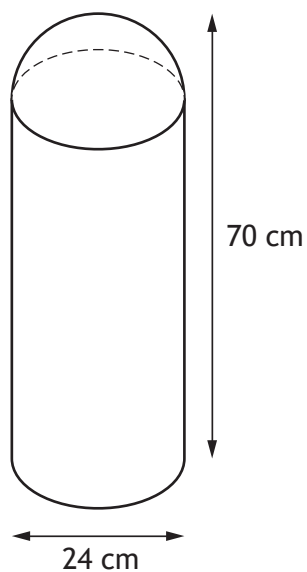


* S 8 4 7 7 5 0 2 1 1 *

10. A traffic bollard is in the shape of a cylinder with a hemisphere on top.

The bollard has:

- diameter 24 centimetres
- height 70 centimetres.



Calculate the volume of the bollard.

Give your answer correct to 3 significant figures.

5

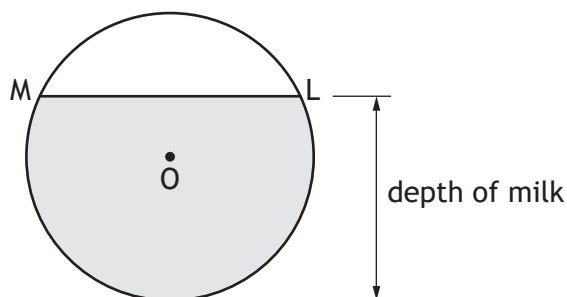
2

11. Express $\frac{3}{a^2} - \frac{2}{a}$, $a \neq 0$, as a single fraction in its simplest form.



* S 8 4 7 7 5 0 2 1 3 *

12. The diagram below shows the circular cross-section of a milk tank.



The radius of the circle, centre O, is 1.2 metres.

The width of the surface of the milk in the tank, represented by ML in the diagram, is 1.8 metres.

Calculate the depth of the milk in the tank.

4



13. Express $\sin x^\circ \cos x^\circ \tan x^\circ$ in its simplest form.

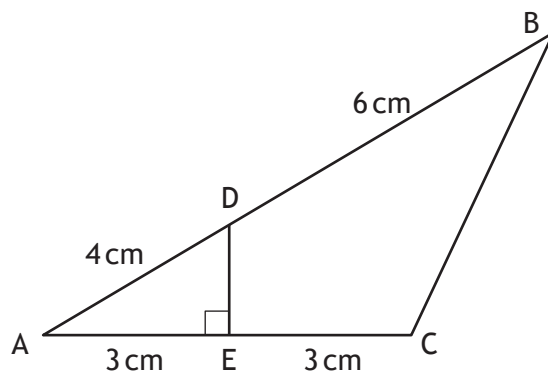
Show your working.

2



* S 8 4 7 7 5 0 2 1 5 *

14. In the diagram below:
- DE is perpendicular to AC
 - $AD = 4$ centimetres
 - $DB = 6$ centimetres
 - $AE = EC = 3$ centimetres.

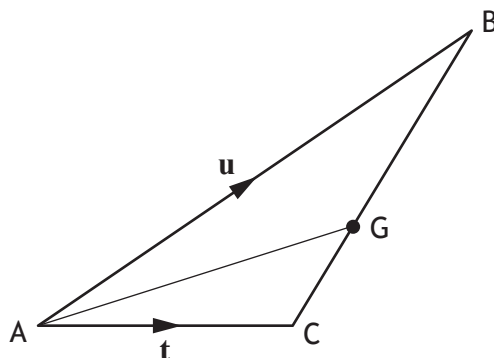


Calculate the length of BC.

Give your answer correct to one decimal place.

4

15. The triangle ABC is shown below



$$\vec{AB} = \mathbf{u} \text{ and } \vec{AC} = \mathbf{t}.$$

G is the point such that $CG = \frac{1}{3}CB$.

Express \vec{AG} in terms of \mathbf{u} and \mathbf{t} .

Give your answer in simplest form.

3

[END OF SPECIMEN QUESTION PAPER]



* S 8 4 7 7 5 0 2 1 7 *

MARKS

DO NOT
WRITE IN
THIS
MARGIN

ADDITIONAL SPACE FOR ANSWERS



* S 8 4 7 7 5 0 2 1 8 *

ADDITIONAL SPACE FOR ANSWERS

