

FOR OFFICIAL USE



National  
Qualifications  
2024

Mark

X847/75/01

Mathematics  
Paper 1 (Non-calculator)

FRIDAY, 3 MAY  
9:00 AM – 10:00 AM



\* X 8 4 7 7 5 0 1 \*

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 — 40

Attempt ALL questions.

You must NOT 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.



\* X 8 4 7 7 5 0 1 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.



\* X 8 4 7 7 5 0 1 0 2 \*

MARKS

DO NOT  
WRITE IN  
THIS  
MARGIN

Total marks — 40  
Attempt ALL questions

1. Evaluate  $3\frac{2}{3} - 1\frac{1}{4}$ .

2

2. Given that  $f(x) = (x+3)^2$ , evaluate  $f(7)$ .

2

[Turn over



\* X 8 4 7 7 5 0 1 0 3 \*

3. Expand and simplify  $(x+1)(x^2-4x+5)$ .

3

4. Given  $\mathbf{a} = \begin{pmatrix} 3 \\ 4 \\ -1 \end{pmatrix}$  and  $\mathbf{b} = \begin{pmatrix} 5 \\ 3 \\ 2 \end{pmatrix}$ , find the resultant vector  $3\mathbf{a} + \mathbf{b}$ .

Express your answer in component form.

2



5. The prices, in pounds (£), of the cameras on display in a shop are listed below.

155    160    190    210    230    240

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

3

On a website, a sample of camera prices have a median of £195 and an interquartile range of £73.

- (b) Make two valid comments comparing the **prices** of the cameras in the shop and on the website.

2

[Turn over



\* X 8 4 7 7 5 0 1 0 5 \*

6. Simplify  $\sqrt{75} - \sqrt{3}$ .

2

7. Solve, algebraically, the system of equations

$$2p - 7r = 11$$

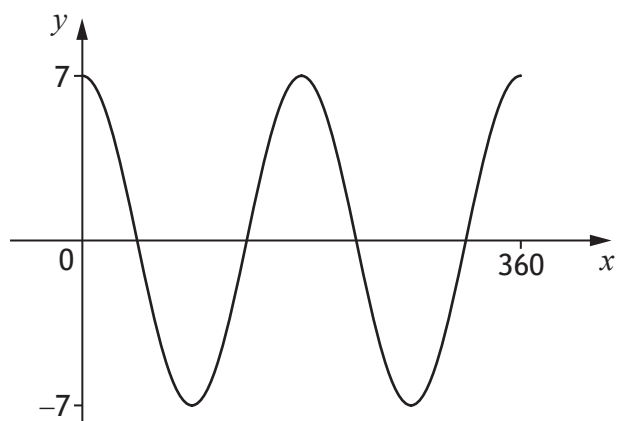
$$3p + 2r = 4$$

3



\* X 8 4 7 7 5 0 1 0 6 \*

8. The graph of  $y = a \cos bx^\circ$ ,  $0 \leq x \leq 360$ , is shown.



(a) State the value of  $a$ .

1

(b) State the value of  $b$ .

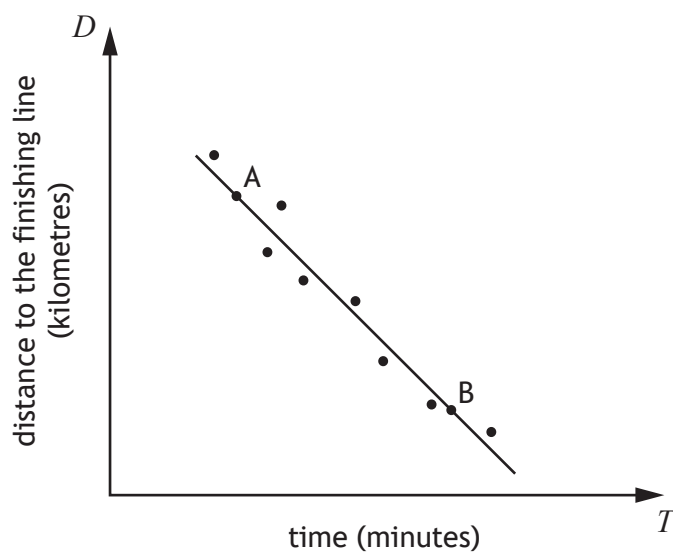
1

[Turn over



9. In a car rally, competitors start at different times.

The scattergraph shows the relationship between the length of time they have been driving,  $T$  minutes, and the distance to the finishing line,  $D$  kilometres.



A line of best fit has been drawn.

Point A represents a competitor who has been driving for 3 minutes and is 26 kilometres from the finishing line.

Point B represents a competitor who has been driving for 10 minutes and is 12 kilometres from the finishing line.

(a) Find the equation of the line of best fit in terms of  $D$  and  $T$ .

Give the equation in its simplest form.

3





9. (continued)

Another competitor has been driving for 7 minutes.

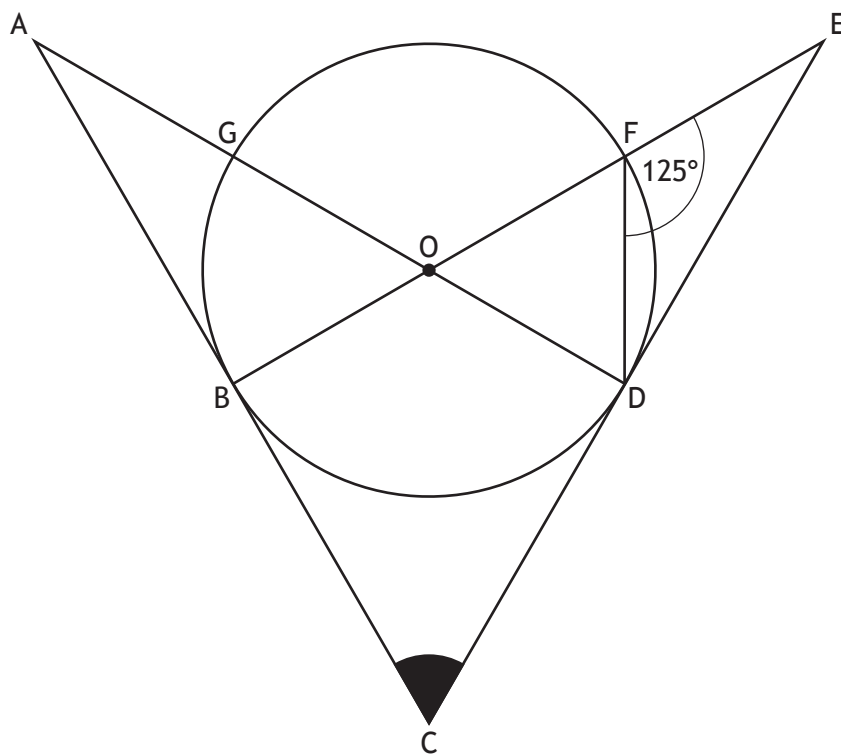
- (b) Use your equation from part (a) to estimate the distance the competitor is from the finishing line.

1

[Turn over



10. The diagram below shows a circle centre O.
- AC is a tangent to the circle at the point B.
  - CE is a tangent to the circle at the point D.
  - DG and BF are diameters of the circle.
  - Angle DFE is  $125^\circ$ .



Calculate the size of shaded angle BCD.

3



MARKS

DO NOT  
WRITE IN  
THIS  
MARGIN

11. A straight line has equation  $x + 4y - 24 = 0$ .  
Find the gradient of this line.

2

[Turn over



\* X 8 4 7 7 5 0 1 1 1 \*

12. (a) Express  $x^2 - 6x + 8$  in the form  $(x - a)^2 + b$ .

2

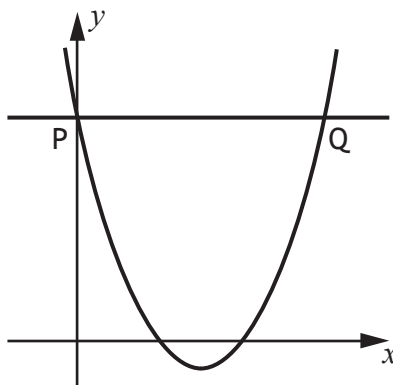
(b) Hence, or otherwise, state the coordinates of the turning point of the graph of  $y = x^2 - 6x + 8$ .

1

The diagram shows the graph of  $y = x^2 - 6x + 8$ .

A line PQ has been drawn parallel to the  $x$ -axis, where:

- P lies on the  $y$ -axis
- P and Q lie on the graph of  $y = x^2 - 6x + 8$ .



(c) Find the coordinates of Q.

2



MARKS

DO NOT  
WRITE IN  
THIS  
MARGIN

2

13. Expand and simplify fully  $x\left(x^{\frac{1}{2}} + x^{-1}\right)$ .

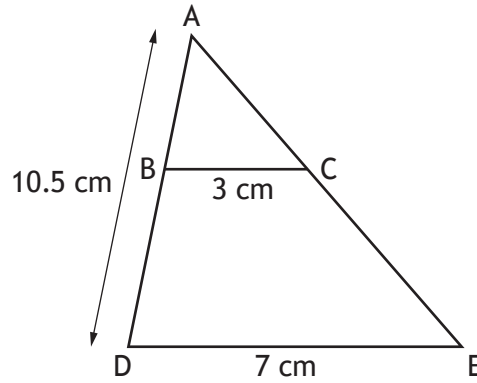
[Turn over



\* X 8 4 7 7 5 0 1 1 3 \*

14. In the diagram, triangles ABC and ADE are mathematically similar.

- $BC = 3$  centimetres
- $DE = 7$  centimetres
- $AD = 10.5$  centimetres



Calculate the length of BD.

3

[END OF QUESTION PAPER]



MARKS DO NOT  
WRITE IN  
THIS  
MARGIN

ADDITIONAL SPACE FOR ANSWERS



MARKS DO NOT  
WRITE IN  
THIS  
MARGIN

ADDITIONAL SPACE FOR ANSWERS

