FOR OFFICIAL USE

N5

National Qualifications 2024

Mark

X847/75/01

Mathematics Paper 1 (Non-calculator)

FRIDAY, 3 MAY

9:00 AM – 10:00 AM

X8477501

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.

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X8477501 01

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 $A = \dfrac{1}{2}ab\sin C$

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

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

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

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 — 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

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

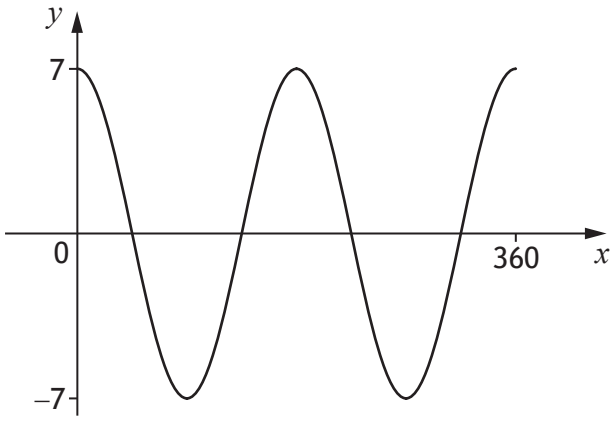
MARKS | DO NOT WRITE IN THIS MARGIN

6. Simplify $\sqrt{75} - \sqrt{3}$. **2**

7. Solve, algebraically, the system of equations

$$2p - 7r = 11$$
$$3p + 2r = 4$$ **3**

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



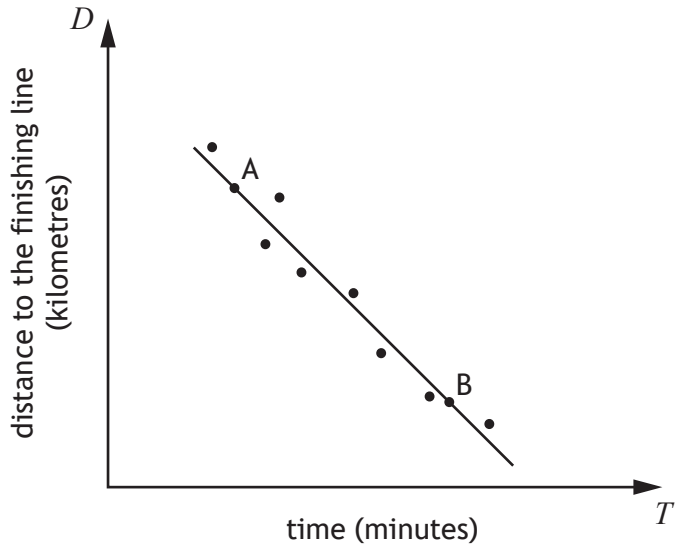
(a) State the value of a. **1**

(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)

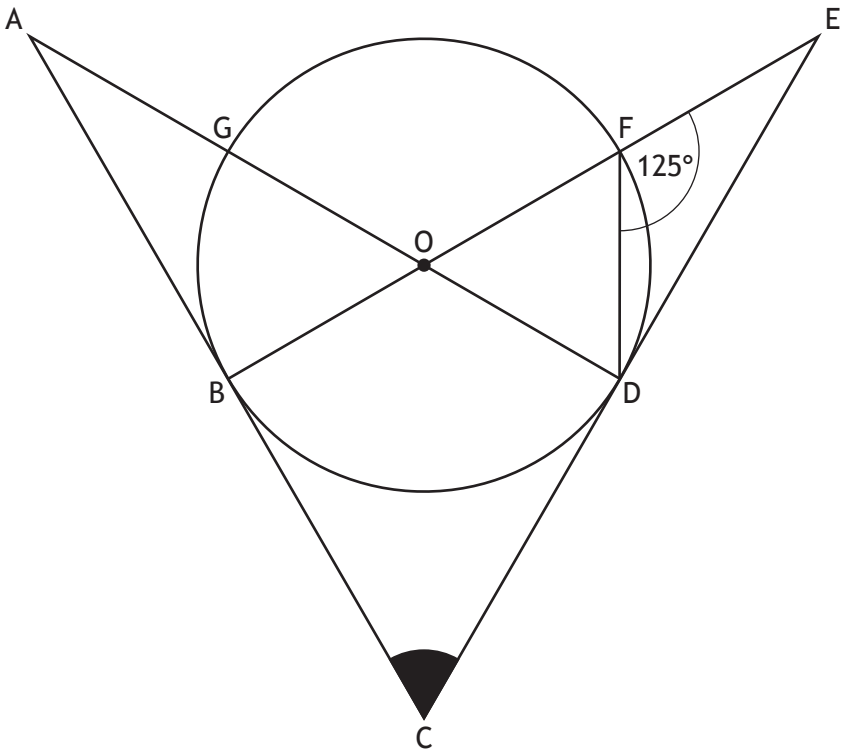
Another competitor has been driving for 7 minutes.

(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°.



Calculate the size of shaded angle BCD. **3**

11. A straight line has equation $x + 4y - 24 = 0$.

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

[Turn over

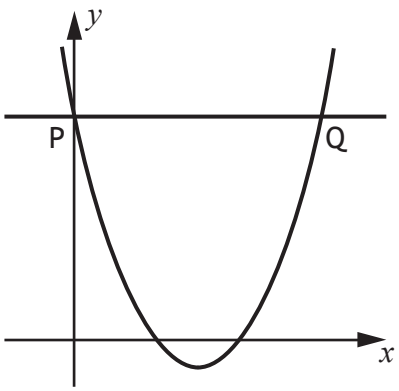
12. (a) Express $x^2 - 6x + 8$ in the form $(x - a)^2 + b$. **2**

(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**

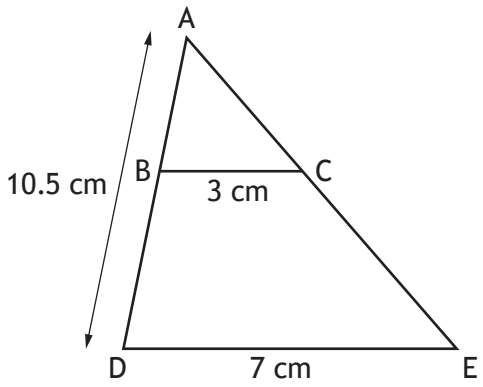
MARKS | DO NOT WRITE IN THIS MARGIN

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

[Turn over

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]

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National Qualifications 2024

Mark

X847/75/02

Mathematics Paper 2

FRIDAY, 3 MAY

10:30 AM – 12:00 NOON

X8477502

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 — 50

Attempt ALL questions.

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X847750201

FORMULAE LIST

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

Total marks — 50

Attempt ALL questions

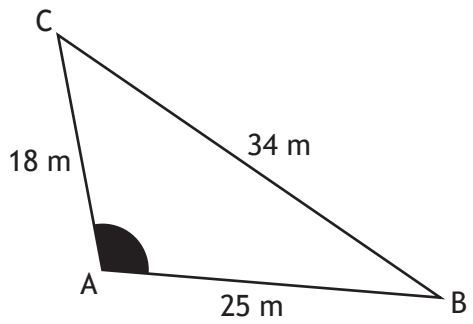
1. Dougie pays £460 for a new laptop.
It is expected that the value of the laptop will depreciate by 26% each year.
Calculate the expected value of Dougie's laptop after 3 years. **3**

2. An ant colony occupies an area of 250 hectares.
There is an average of 1.22×10^6 ants per hectare.
Calculate the number of ants in the colony.
Give your answer in scientific notation. **2**

[Turn over

3. In triangle ABC:

- AB = 25 metres
- AC = 18 metres
- BC = 34 metres.



Calculate the size of the shaded angle at A. **3**

4. Solve, algebraically, the inequation

$$5(x-2)+4<7x+8.$$ **3**

5. This year the cost of Charley's car insurance is £278.40.
This is an increase of 16% on last year's cost.
Calculate the cost of Charley's insurance last year. **3**

[Turn over

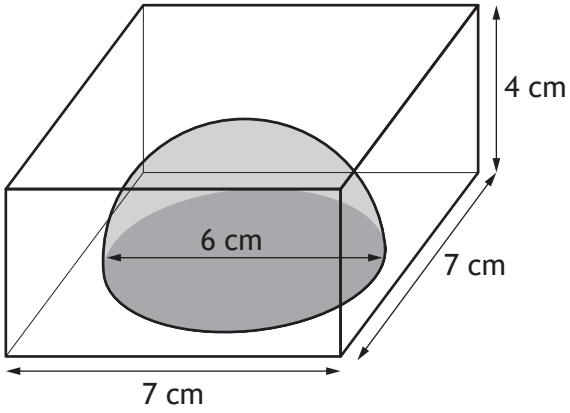
MARKS | DO NOT WRITE IN THIS MARGIN

6. (a) Factorise $y^2 - 6y$. **1**

(b) Hence simplify $\dfrac{y^2 - 6y}{y^2 - 3y - 18}$. **2**

7. A paperweight is in the shape of a cuboid.

It consists of a hemisphere of red glass surrounded by clear glass.



The cuboid has height 4 centimetres and a square base of length 7 centimetres.

The hemisphere has diameter 6 centimetres.

Calculate the volume of clear glass in the paperweight.

Give your answer correct to 2 significant figures. **4**

[Turn over

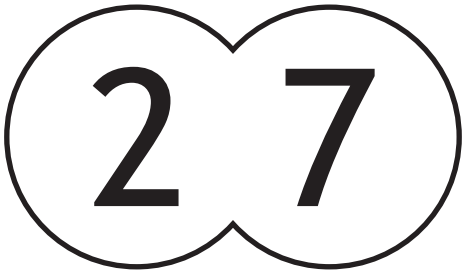
8. Solve the equation $3x^2 + 8x + 1 = 0$.

Give your answers correct to 2 decimal places. **3**

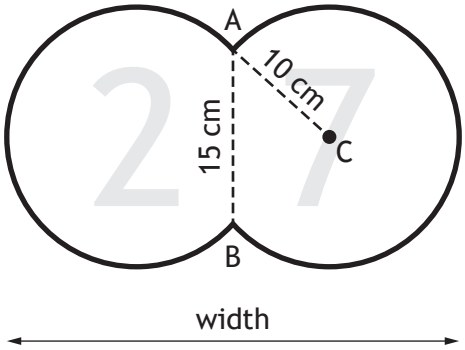
9. Change the subject of the formula $f = \frac{2d + 3}{e}$ to d. **3**

10. Karen buys a door-number sign for her house.

The sign consists of parts of two identical circles.



AB is a chord to both circles.



- AB has length 15 centimetres.
- The radius AC has length 10 centimetres.

Calculate the width of the sign. **4**

[Turn over

11. Solve the equation $17\sin x° + 1 = 9$, for $0 \leq x < 360$. **3**

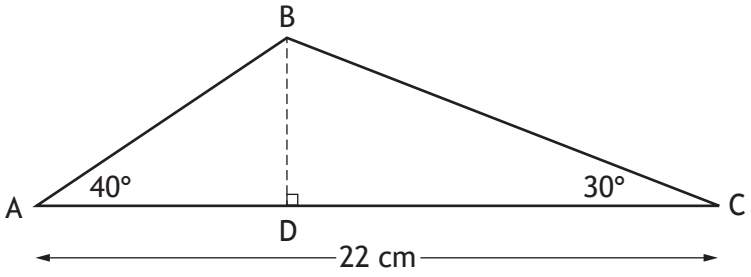
12. Express

$$\frac{2}{x+5} + \frac{3}{x-4}, \quad x \neq -5, x \neq 4$$

as a single fraction in its simplest form. **3**

MARKS DO NOT WRITE IN THIS MARGIN

13. In triangle ABC:



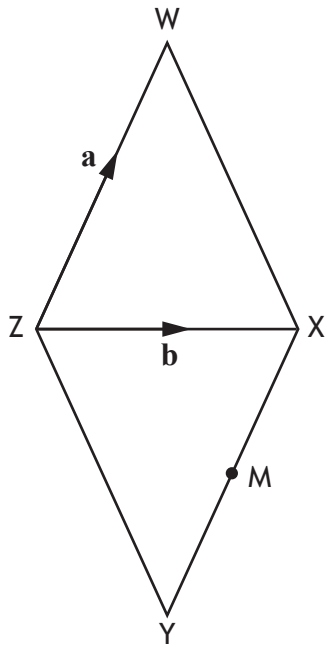
- AC = 22 centimetres
- angle BAC = 40°
- angle BCA = 30°
- BD is perpendicular to AC.

Calculate the length of BD. **5**

[Turn over

MARKS DO NOT WRITE IN THIS MARGIN

14. The diagram shows a rhombus WXYZ with a diagonal ZX drawn.



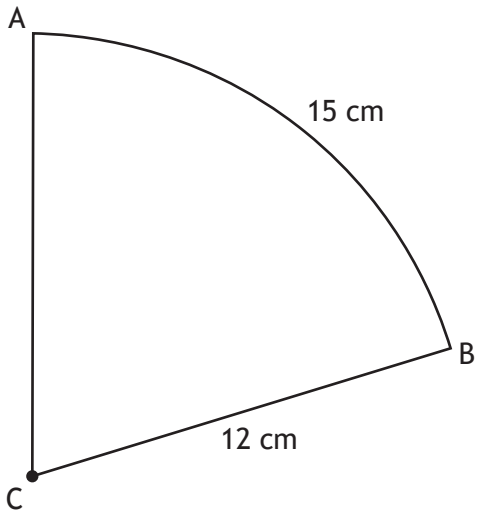
$\overrightarrow{ZW}$ represents vector $\mathbf{a}$ and $\overrightarrow{ZX}$ represents vector $\mathbf{b}$.

(a) Express $\overrightarrow{WX}$ in terms of $\mathbf{a}$ and $\mathbf{b}$. **1**

M is the mid-point of XY.

(b) Express $\overrightarrow{WM}$ in terms of $\mathbf{a}$ and $\mathbf{b}$.
Give your answer in its simplest form. **2**

15. The diagram shows a sector of a circle, centre C.



The radius of the circle is 12 centimetres.

The length of arc AB is 15 centimetres.

Calculate the area of the sector. **3**

[Turn over

16. Express $3\cos^2 x° - 1$ in the form $a + b\sin^2 x°$.

Show your working. **2**

[END OF QUESTION PAPER]