

FOR OFFICIAL USE



National Qualifications 2025

Mark

X847/75/01

Mathematics Paper 1 (Non-calculator)

WEDNESDAY, 14 MAY  
9:00 AM – 10:00 AM



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.



## 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 \*

Total marks — 40  
Attempt ALL questions

1. Evaluate  $2\frac{4}{5} \times \frac{2}{7}$ .

Give your answer in its simplest form.

2

$$2 \frac{14}{5} \times \frac{2}{7}$$

$$= \underline{\underline{\frac{4}{5}}}$$

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

3

$$x^2 + 8x + 15 + 4x - 8$$

$$\underline{\underline{x^2 + 12x + 7}}$$

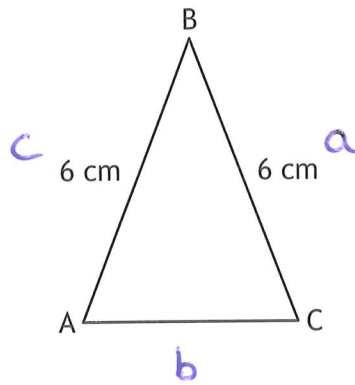
	$x + 5$
$x$	$x^2 + 5x$
$+3$	$+3x + 15$

[Turn over





5. Triangle ABC is shown in the diagram.



- $AB = BC = 6$  centimetres.
- $\sin B = \frac{2}{3}$ .

Calculate the area of the triangle.

2

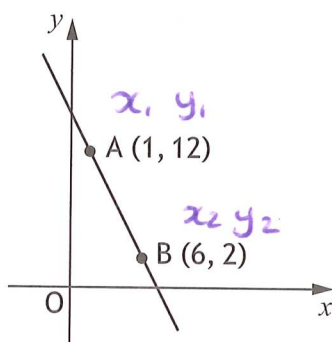
$$\begin{aligned}
 A_{\Delta} &= \frac{1}{2} ac \sin B \\
 &= \frac{1}{2} \times 6 \times 6 \times \frac{2}{3} \\
 &= 3 \times 4
 \end{aligned}$$

$$\underline{\underline{\text{Area} = 12 \text{ cm}^2}}$$

[Turn over



6. The diagram shows the straight line passing through points A and B.



Find the equation of the line AB.

Give the equation in its simplest form.

3

Gradient  $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 12}{6 - 1} = \frac{-10}{5} = -2$

Equation  $y - b = m(x - a)$

$m = -2$

$y - 2 = -2(x - 6)$

$a = 6$

$y - 2 = -2x + 12$

$b = 2$

$y = -2x + 14.$



7. A function is defined as  $f(x) = 3x + 7$ .

(a) Evaluate  $f(6)$ .

1

$$\begin{aligned} f(6) &= 3(6) + 7 \\ &= 18 + 7 \end{aligned}$$

$$\underline{\underline{f(6) = 25}}$$

(b) Given that  $f(p) = 19$ , find the value of  $p$ .

2

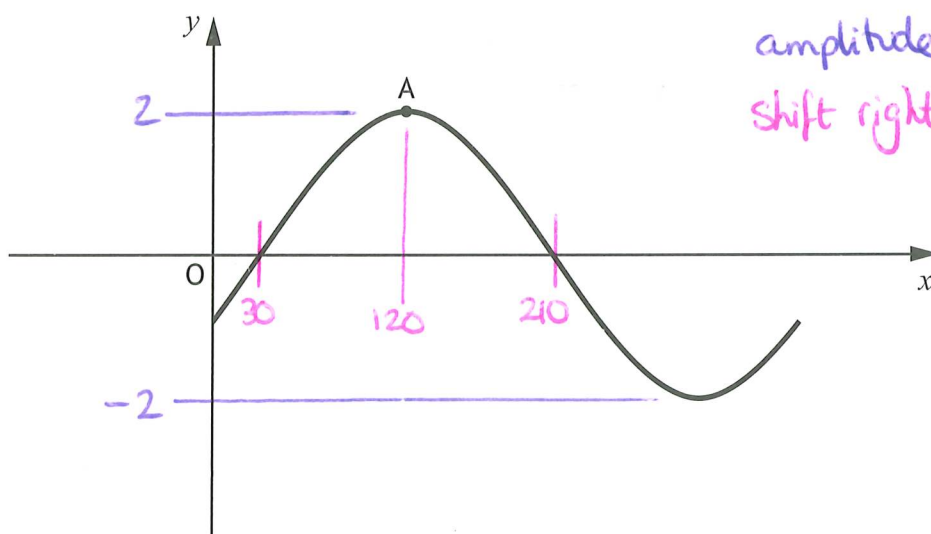
$$f(p) = 3p + 7 \quad \therefore \quad 3p + 7 = 19$$

$$f(p) = 19$$

$$3p = 12$$

$$\underline{\underline{p = 4}}$$

8. Part of the graph of  $y = 2 \sin(x - 30)^\circ$  is shown in the diagram.



The graph has a maximum turning point at A.

State the coordinates of A.

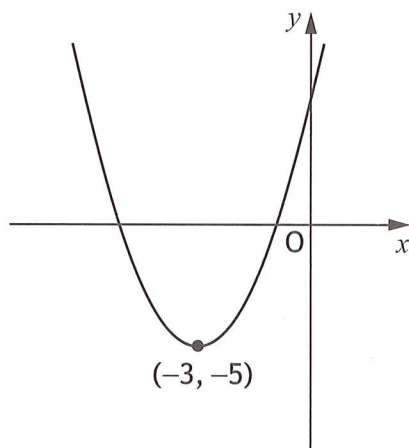
2

Point A (120°, 2)

[Turn over



9. The diagram shows a parabola with equation of the form  $y = (x + a)^2 + b$ .



$$y = (x + 3)^2 - 5$$

(a) State the value of  $a$ .

1

$$\underline{\underline{a = 3}}$$

(b) State the value of  $b$ .

1

$$\underline{\underline{b = -5}}$$

10. Simplify  $\frac{n^7 \times (n^3)^2}{n^4}$ .

3

$$\frac{n^7 \times n^6}{n^4} = \frac{n^{13}}{n^4} = \underline{\underline{n^9}}$$



11. Determine the nature of the roots of the function  $f(x) = 3x^2 + 2x + 1$ .

2

$$ax^2 + bx + c$$

$$a = 3$$

$$\Delta = b^2 - 4ac$$

$$b = 2$$

$$= (2)^2 - 4(3)(1)$$

$$c = 1$$

$$= 4 - 12$$

$$\Delta = -8$$

Since  $b^2 - 4ac < 0$ , then the function  $f(x)$  has no real roots.

12. Express  $\frac{6}{\sqrt{10}}$  with a rational denominator.

Give your answer in its simplest form.

2

$$\frac{6}{\sqrt{10}} \times \frac{\sqrt{10}}{\sqrt{10}} = \frac{6\sqrt{10}}{10} = \frac{3\sqrt{10}}{5}$$

[Turn over

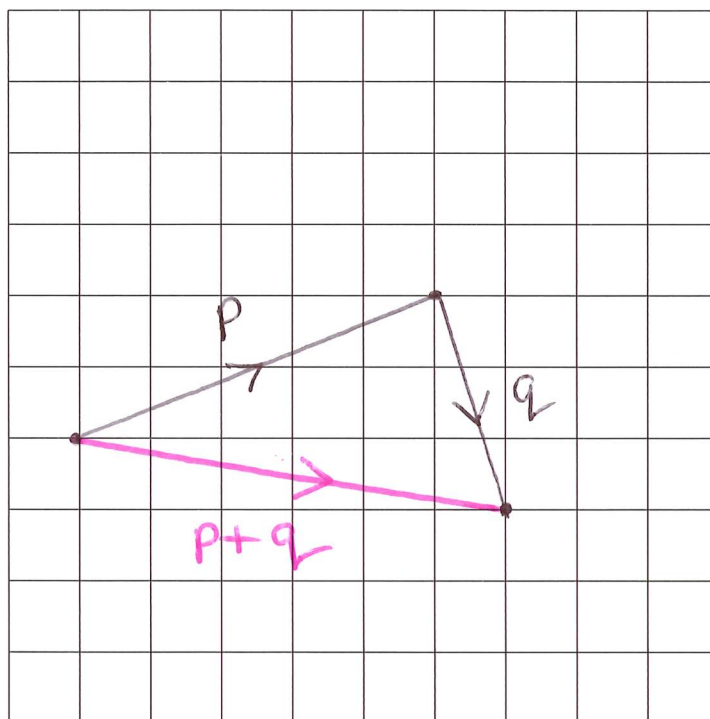


13. Vectors  $\mathbf{p}$  and  $\mathbf{q}$  have components  $\mathbf{p} = \begin{pmatrix} 5 \\ 2 \end{pmatrix}$  and  $\mathbf{q} = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$ .

Draw the resultant vector  $\mathbf{p} + \mathbf{q}$  on the grid.

(An additional grid, if required, can be found on page 14.)

2



check:  $\mathbf{p} + \mathbf{q} = \begin{pmatrix} 5 \\ 2 \end{pmatrix} + \begin{pmatrix} 1 \\ -3 \end{pmatrix} = \begin{pmatrix} 6 \\ -1 \end{pmatrix}$



14. Express

$$\frac{5}{x-1} - \frac{4}{x}, \quad x \neq 1, x \neq 0$$

as a single fraction in its simplest form.

3

$$\frac{5x}{x(x-1)} - \frac{4(x-1)}{x(x-1)}$$

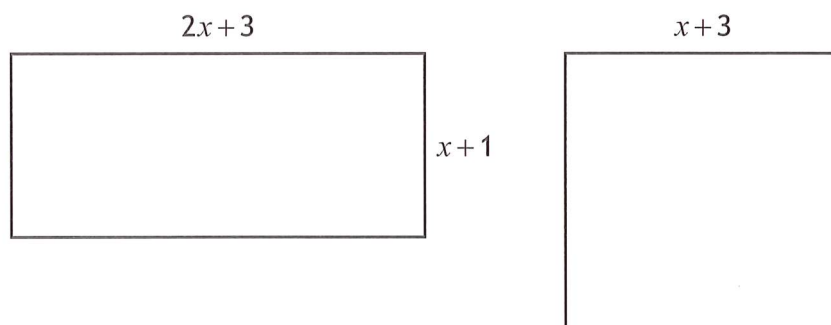
$$= \frac{5x - 4x + 4}{x(x-1)}$$

$$= \frac{x + 4}{x(x-1)}$$

[Turn over



15. The diagrams of a rectangle and square are shown below.  
All measurements are in centimetres.



- (a) Find an expression for the area of the rectangle. 1

$$\begin{aligned} \text{Area} &= L \times b \\ \text{Area} &= (2x+3)(x+1) \end{aligned}$$

- (b) Given that the area of the rectangle is equal to the area of the square, show that  $x^2 - x - 6 = 0$ . 2

$$\begin{aligned} \text{Rectangle} &= 2x^2 + 5x + 3 & \begin{array}{r|l} & x + 1 \\ 2x & 2x^2 + 2x \\ +3 & +3x + 3 \end{array} \\ \text{Square} &= (x+3)^2 \\ &= x^2 + 6x + 9 & \begin{array}{r|l} & x + 3 \\ x & x^2 + 3x \\ +3 & +3x + 9 \end{array} \end{aligned}$$

Let Rectangle = Square

$$2x^2 + 5x + 3 = x^2 + 6x + 9$$

$$\underline{\underline{x^2 - x - 6 = 0}} \quad \text{as required. } \textcircled{\text{smiley}}$$

15. (continued)

(c) Hence find, algebraically, the length and breadth of the rectangle.

3

Solve  $x^2 - x - 6 = 0$

$(x+2)(x-3) = 0$

$x+2=0$   
 ~~$x = -2$~~

$x-3=0$   
 $x=3$

	$x$	$-3$
$x$	$x^2$	$-3x$
$+2$	$+2x$	$-6$

For rectangle,  $x+1 > 0$   $\therefore x \neq -2$   
 $2x+3 > 0$

$\hookrightarrow x = 3 \text{ cm}$

Length =  $2x+3$   
=  $2(3)+3$

Length = 9cm

Breadth =  $x+1$   
=  $3+1$

Breadth = 4cm

[END OF QUESTION PAPER]



ADDITIONAL SPACE FOR ANSWERS

Additional grid for question 13
