



Cambridge International AS & A Level

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MATHEMATICS

9709/11

Paper 1 Pure Mathematics 1

October/November 2025

1 hour 50 minutes

You must answer on the question paper.

You will need: List of formulae (MF19)

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- If additional space is needed, you should use the lined page at the end of this booklet; the question number or numbers must be clearly shown.
- You should use a calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.

INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [].

This document has **20** pages. Any blank pages are indicated.



- 1** Find the set of values of the constant k for which the quadratic equation

$$3kx^2 + (k+8)x + 3 = 0$$

has two distinct real roots.

[4]

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

- 2 A geometric progression has first term a and common ratio $\cos \theta$, where $0 < \theta < \frac{1}{2}\pi$. It is given that the second term is 8 and the fifth term is $\frac{1}{8}$.

(a) Find the value of θ . Give your answer correct to 3 significant figures. [3]

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(b) Find the exact value of the sum to infinity. [2]

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$$(px+3)^5 - \left(x^3 + \frac{p}{x}\right)^4,$$

Find the value of the positive constant p .

[illegible]

- 4 (a) Express $1 - 6x - x^2$ in the form $a - (x + b)^2$, where a and b are constants. [3]

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- (b) The graph of $y = x^2$ is transformed to the graph of $y = 1 - 6x - x^2$ by a reflection followed by a translation of $\begin{pmatrix} m \\ n \end{pmatrix}$. Give details of the reflection and determine the values of m and n . [3]

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5 (a) Show that $\tan^4 \theta - 1 \equiv \frac{1 - 2 \cos^2 \theta}{\cos^4 \theta}$.

[3]

(b) Hence solve the equation $\cos^2 \theta (\tan^4 \theta - 1) = 7$ for $0^\circ < \theta < 180^\circ$.

[4]



6 Functions f and g are defined by

$$f(x) = (x + 3)^2 - 12 \quad \text{for } x \geq 0,$$

$$g(x) = 2x - 5 \quad \text{for } x \in \mathbb{R}.$$

(a) State the range of f . [1]

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(b) Find an expression for $f^{-1}(x)$. [2]

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(c) Solve the equation $gf(x) = 69$. [4]

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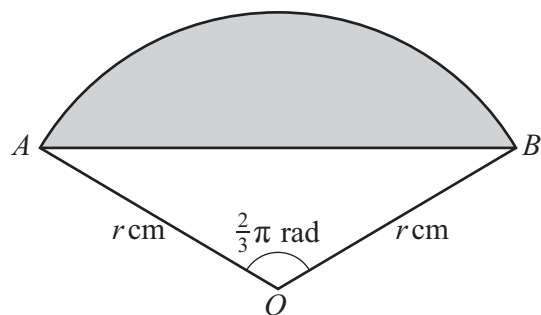
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The diagram shows a sector of a circle with centre O and radius r cm. The shaded region is bounded by the chord AB and the arc AB . The size of angle AOB is $\frac{2}{3}\pi$ radians.

- (a) Show that the area of the shaded region is approximately $0.614r^2 \text{ cm}^2$. [2]

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

It is given that the radius of the circle is increasing at a rate of 0.4 cm s^{-1} .

- (b) (i) Find the rate of increase of the area of the shaded region at the instant when $r = 20$.
Give your answer correct to 2 significant figures.

[3]

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- (ii) Find the rate of increase of the length of the arc AB . Give your answer correct to 2 significant figures.

[3]

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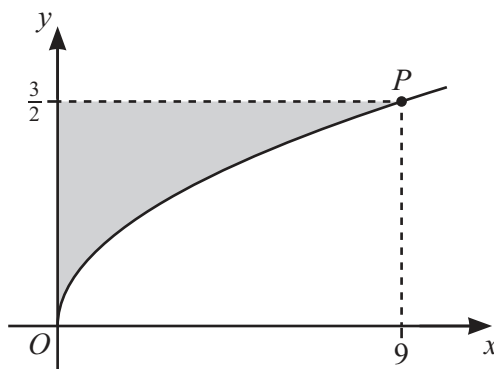
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The diagram shows the curve with equation $y = \frac{1}{2}\sqrt{x}$ and the point P with coordinates $\left(9, \frac{3}{2}\right)$. The shaded region is bounded by the curve and the lines $x = 0$ and $y = \frac{3}{2}$.

- (a) Find the area of the shaded region.

[3]

This image shows a full page of a worksheet designed for handwriting practice. It features 18 evenly spaced, horizontal dashed lines across the entire width of the page. The background is plain white, providing a clear guide for letter formation and alignment. There are no margins, text, or other markings present.



(b) The shaded region is rotated through 360° about the **y-axis**.

Find the exact volume of the solid produced.

[4]

[illegible]



- 9 An arithmetic progression has first term 2 and common difference d . The sum of the first n terms is denoted by S_n .

- (a)** It is given that $(S_2 - 1)$, S_4 , S_9 are the first three terms of a second arithmetic progression.

Find the value of d .

[4]

[illegible]



(b) Hence find the difference between the values of the 15th terms of the two arithmetic progressions. [4]

[illegible]



- 10** A circle has equation $x^2 + y^2 + 4y - 21 = 0$ and a straight line has equation $2x + y - 8 = 0$. The line intersects the circle at two points.

(a) Find the coordinates of these two points of intersection.

[4]

[illegible]



(b) The circle has centre C and the two points of intersection are denoted by A and B .

Find the area of the triangle ABC .

[3]



- 11 A curve passes through the point $P(4, 3)$ and is such that

$$\frac{dy}{dx} = \frac{8}{x^2} - \frac{10}{(2x-3)^2}.$$

- (a) Find the equation of the normal to the curve at P . Give your answer in the form $y = mx + c$. [3]

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- (b) Find the rate of change of the gradient of the curve when $x = 4$. [3]

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(c) Given that the curve also passes through the point $(-1, q)$, find the value of q .

[5]

[illegible]



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