



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]

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- 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]

This image shows a full page of white paper with ten horizontal dashed lines, typical of primary school handwriting practice paper. The lines are evenly spaced and extend across the entire width of the page. There is no text or other markings on the paper.



3 In the expansion of

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

the coefficient of x^4 is 216.

Find the value of the positive constant p .

[5]

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

[3]

- (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]



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]

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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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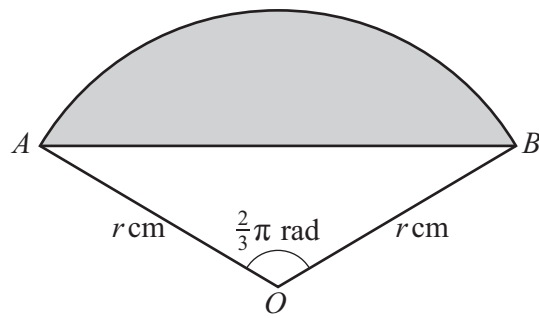
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7



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]

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

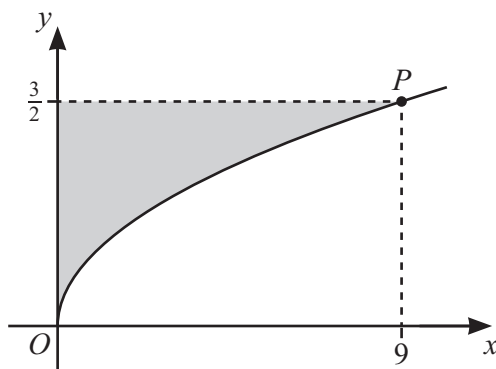
- (b) (i)** Find the rate of increase of the area of the shaded region at the instant when $r = 20$. Give your answer correct to 2 significant figures.

[3]

- (ii) Find the rate of increase of the length of the arc AB . Give your answer correct to 2 significant figures. [3]

[3]





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]





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

Find the exact volume of the solid produced.

[4]

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- 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]

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

[4]

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- 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]

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- (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]

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- 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]

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