



Cambridge International AS & A Level

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MATHEMATICS

9709/12

Paper 1 Pure Mathematics 1

February/March 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

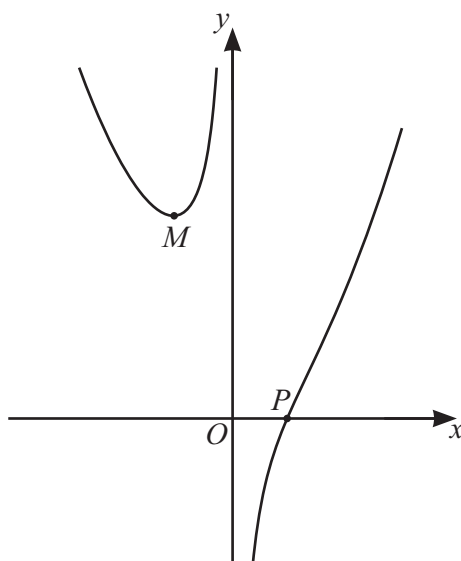
- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [].

This document has **16** pages.



- [4]

This image shows a full page of a handwriting practice worksheet. It consists of approximately 20 horizontal rows. Each row is defined by two parallel dotted lines, creating a series of uniform gaps for letter height. The entire page is otherwise blank, with no margins, text, or other markings.



The diagram shows the curve with equation $y = 2x^2 - \frac{5}{x} + 3$. The curve crosses the x -axis at the point $P(1, 0)$ and M is a minimum point.

- (a) Find the gradient of the curve at P . [2]

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- (b) Find the coordinates of M . Give each coordinate correct to 3 significant figures. [3]

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- 3 (a) Find the complete expansion of $\left(2x - \frac{3}{x}\right)^4$. [4]

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- (b) Hence determine the coefficient of x^2 in the expansion of $(x^2 + 5)\left(2x - \frac{3}{x}\right)^4$. [2]

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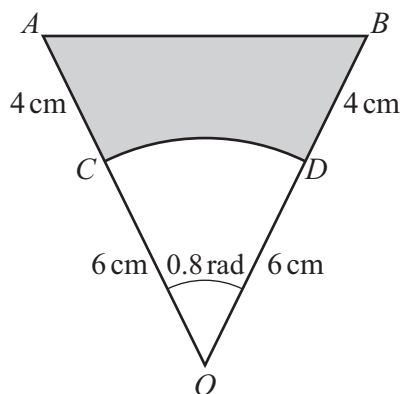
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The diagram shows a triangle OAB where $OA = OB = 10$ cm and angle $AOB = 0.8$ radians. Points C and D on OA and OB respectively are such that the arc CD is part of a circle with centre O and radius 6 cm. The shaded region is bounded by the arc CD and the line segments CA , AB and BD .

- (a) Find the perimeter of the shaded region. [3]

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- (b) Find the area of the shaded region. [3]

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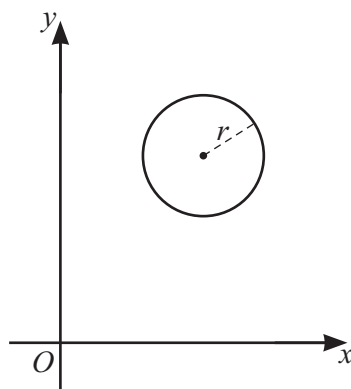


5 An arithmetic progression has first term 5 and common difference 6.

For this progression, find the sum of all the terms that lie between 150 and 400.

[6]

[illegible]



The diagram shows a circle C of radius r , where $x > 0$ and $y > 0$ for all points on C . The least distance between any point on C and the x -axis is 8 units, and the least distance between any point on C and the y -axis is 5 units.

- (a) State the coordinates of the centre of the circle in terms of r . [1]

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- (b) Given that the distance between the origin and the centre of the circle is 15 units, find the value of r . [3]

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- (c) The point on the circle furthest from the origin is denoted by P .

Find the gradient of the tangent to the circle at P . [2]

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[3]

[illegible]



(b) Hence solve the equation $3 \tan^2 \theta + 5 \sin^2 \theta = 9$ for $0^\circ < \theta < 270^\circ$.

[4]

[illegible]



8 A geometric progression is such that its second term is -120 and its sum to infinity is 160 .

(a) Find the common ratio.

[4]

[illegible]

(b) The first nine terms of the progression are now removed.

Find the sum to infinity of the remaining terms of the progression.

[3]

[illegible]



9 A curve is such that $\frac{d^2y}{dx^2} = \frac{6}{x^4} - \frac{5}{x^3}$. It is given that the curve has a stationary point at $(\frac{1}{2}, 9)$.

(a) Use the expression for $\frac{d^2y}{dx^2}$ to determine whether the stationary point is a maximum or a minimum point. [2]

(b) Find the equation of the curve. [7]





13

(b) Find the area of region B .

[5]

[illegible]



11 Functions f and g are defined for all real values of x by

$$f(x) = 4x^2 - c \quad \text{and} \quad g(x) = 2x + k,$$

where c and k are positive constants. It is given that $g^{-1}(3k+1) = c$.

(a) Show that $gf(x) = 8x^2 - k - 1$.

[4]

[illegible]



- (b) The curve with equation $y = 8x^2 - k - 1$ is transformed to the curve with equation $y = h(x)$ by the following sequence of transformations.

Translation of $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$

Stretch in the y -direction by scale factor k

Reflection in the x -axis

Find an expression for $h(x)$ in terms of x and k . [3]

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- (c) The range of h is given by $h(x) \leq 15$.

Find the values of c and k . [3]

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