



Cambridge International AS & A Level

CANDIDATE
NAME

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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 [].

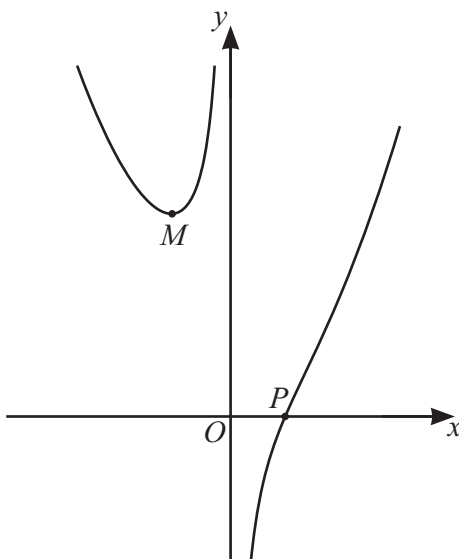
This document has **16** pages.

- 1** A curve has equation $y = 5 + 3x - 2x^2$ and a straight line has equation $y = kx + 13$, where k is a constant.

[4]

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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 $\left(2x - \frac{3}{x}\right)^4$.

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

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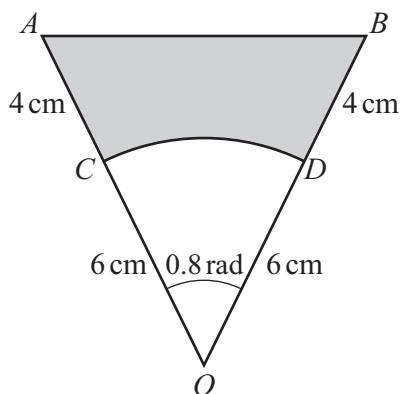
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The diagram shows a triangle OAB where $OA = OB = 10$ cm and angle $AOB = 0.8$ radians. Points C and D on OA and OB respectively are such that the arc CD is part of a circle with centre O and radius 6 cm. The shaded region is bounded by the arc CD 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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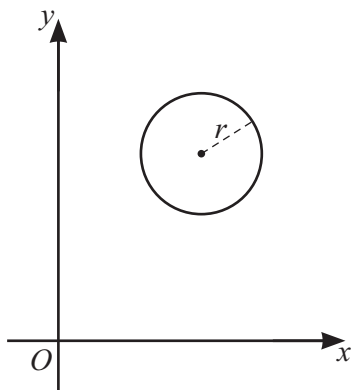
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For this progression, find the sum of all the terms that lie between 150 and 400.

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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]

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[4]

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

(a) Find the common ratio.

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

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

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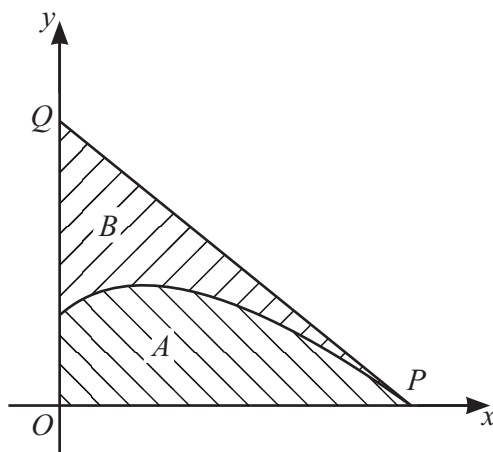
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The diagram shows the curve with equation

$$y = 4(3x + 4)^{\frac{1}{2}} - 2x - 6$$

for values of x such that $0 \leq x \leq 7$. The tangent to the curve at the point $P(7, 0)$ meets the y -axis at the point Q . Region A is bounded by the curve and the two axes. Region B is bounded by the curve, the line segment PQ and the y -axis.

- (a) Find the area of region A .

[4]

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[5]

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

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

[4]

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- (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 .

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

Find the values of c and k .

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