



# 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

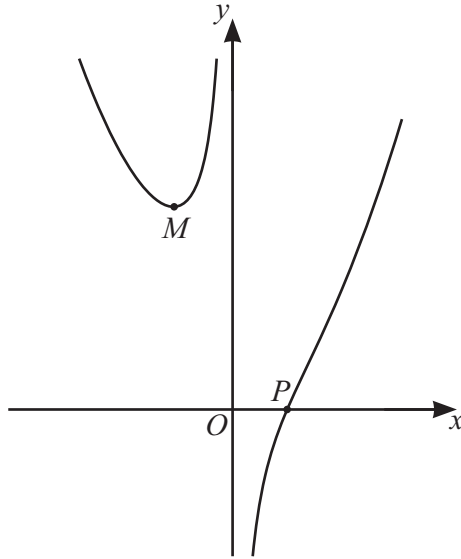
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction 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.

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- 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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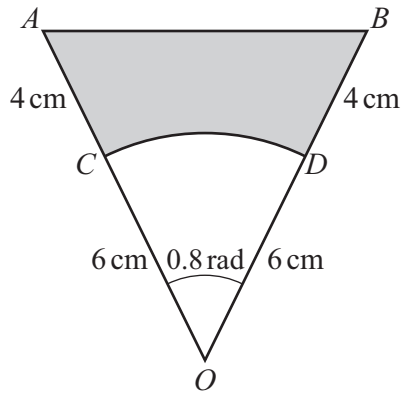
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[illegible][illegible]



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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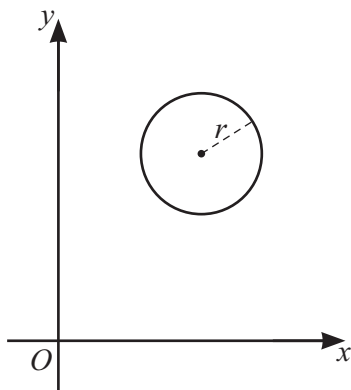


5 An arithmetic progression has first term 5 and common difference 6.

For this progression, find the sum of all the terms that lie between 150 and 400. [6]

[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]

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[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]

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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.

[3]

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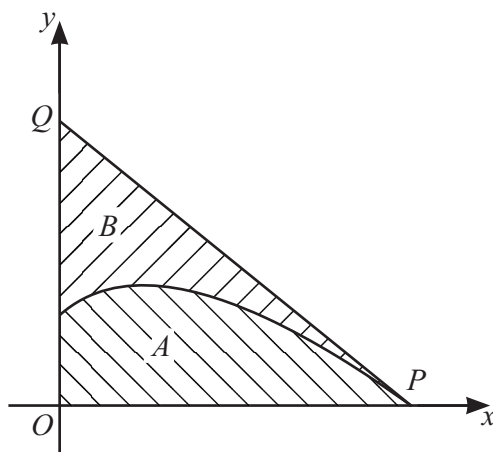
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- (a) Use the expression for  $\frac{d^2y}{dx^2}$  to determine whether the stationary point is a maximum or a minimum point. [2]

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



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]

[illegible]



[5]

This image shows a full page of a handwriting practice worksheet. It consists of multiple rows of horizontal dotted lines spaced evenly down the page, providing a guide for letter height and placement. The background is plain white, and there are no other markings or text present.

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

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

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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