



# Cambridge International AS & A Level

CANDIDATE  
NAME



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**MATHEMATICS**

**9709/11**

Paper 1 Pure Mathematics 1

**October/November 2024**

**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.

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- 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.

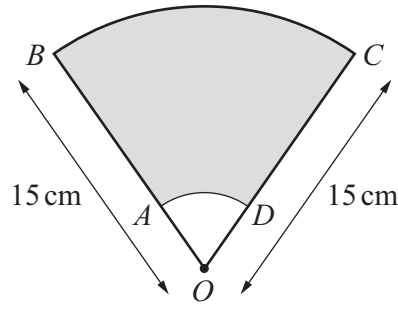
Find the values of the constants  $a$  and  $b$ .

[4]

[illegible]



3



The diagram shows a sector of a circle, centre  $O$ , where  $OB = OC = 15$  cm. The size of angle  $BOC$  is  $\frac{2}{5}\pi$  radians. Points  $A$  and  $D$  on the lines  $OB$  and  $OC$  respectively are joined by an arc  $AD$  of a circle with centre  $O$ . The shaded region is bounded by the arcs  $AD$  and  $BC$  and by the straight lines  $AB$  and  $DC$ . It is given that the area of the shaded region is  $\frac{209}{5}\pi$  cm<sup>2</sup>.

Find the perimeter of the shaded region. Give your answer in terms of  $\pi$ .

[5]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

[illegible]



5 The equation of a curve is such that  $\frac{dy}{dx} = 4x - 3\sqrt{x} + 1$ .

(a) Find the  $x$ -coordinate of the point on the curve at which the gradient is  $\frac{11}{2}$ . [3]

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(b) Given that the curve passes through the point (4, 11), find the equation of the curve. [4]

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6 Circles  $C_1$  and  $C_2$  have equations

$$x^2 + y^2 + 6x - 10y + 18 = 0 \quad \text{and} \quad (x-9)^2 + (y+4)^2 - 64 = 0$$

respectively.

(a) Find the distance between the centres of the circles.

[4]

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$P$  and  $Q$  are points on  $C_1$  and  $C_2$  respectively. The distance between  $P$  and  $Q$  is denoted by  $d$ .

(b) Find the greatest and least possible values of  $d$ .

[3]

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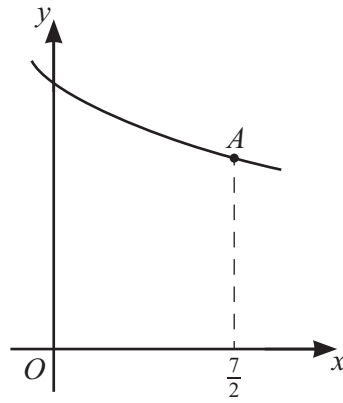
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The diagram shows part of the curve with equation  $y = \frac{12}{\sqrt[3]{2x+1}}$ . The point  $A$  on the curve has coordinates  $\left(\frac{7}{2}, 6\right)$ .

- (a)** Find the equation of the tangent to the curve at  $A$ . Give your answer in the form  $y = mx + c$ . [4]

[illegible]



This image shows a full page of white paper with horizontal dotted lines, typical of primary school writing paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

- Express  $\tan^2 \beta - 3 \sin \beta \cos \beta$  in terms of  $\alpha$ .

[illegible]



[5]

[illegible]

**(a)** Find the set of values of  $x$  for which  $y$  decreases as  $x$  increases.

[4]

[illegible]



[4]

[illegible]

- (a)** Find the value of  $d$ .

[illegible]



- Find the value of  $S_{77} - G_{10}$ .

[5]

[illegible]

- (a) Express  $f(x)$  in the form  $a - b(x - c)^2$ , where  $a$ ,  $b$  and  $c$  are constants, and state the range of  $f$ . [3]

This image shows a full page of white paper with horizontal dashed lines, typical of primary-ruled notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

- Give details of the reflection and translation involved.

[illegible]



11

- (d)** Sketch the graph of  $y = g^{-1}(x)$  on your diagram in **(c)**, and find an expression for  $g^{-1}(x)$ . You should label the two graphs in your diagram appropriately and show any relevant mirror line. [4]

[illegible]



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