



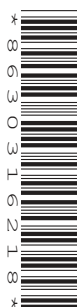
# Cambridge International AS & A Level

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NAME
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NUMBER

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**MATHEMATICS****9709/13**

Paper 1 Pure Mathematics 1

**May/June 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.





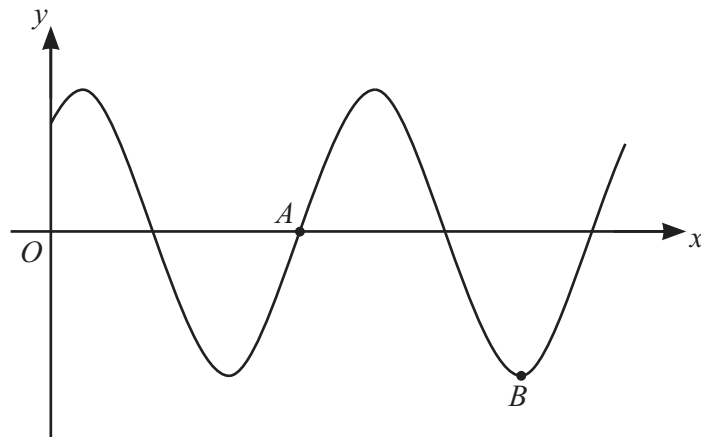
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[4]

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 margins or additional markings.



2 (a)



The diagram shows the curve  $y = k \cos\left(x - \frac{1}{6}\pi\right)$  where  $k$  is a positive constant and  $x$  is measured in radians. The curve crosses the  $x$ -axis at point  $A$  and  $B$  is a minimum point.

Find the coordinates of  $A$  and  $B$ .

[3]

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(b) Find the exact value of  $t$  that satisfies the equation

$$3 \sin^{-1}(3t) + 2 \cos^{-1}\left(\frac{1}{2}\sqrt{2}\right) = \pi.$$

[2]

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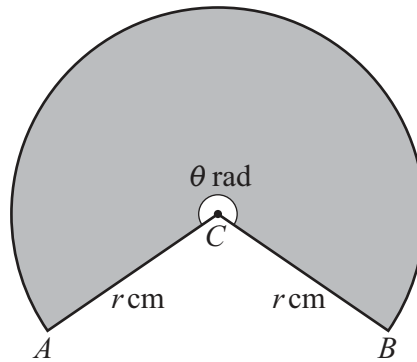
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3



The diagram shows a sector of a circle with centre  $C$ . The radii  $CA$  and  $CB$  each have length  $r$  cm and the size of the reflex angle  $ACB$  is  $\theta$  radians. The sector, shaded in the diagram, has a perimeter of 65 cm and an area of  $225 \text{ cm}^2$ .

- (a) Find the values of  $r$  and  $\theta$ . [4]

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

- (b)** Find the area of triangle  $ACB$ . [2]

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- 4 (a) Show that the equation  $\cos \theta (7 \tan \theta - 5 \cos \theta) = 1$  can be written in the form  $a \sin^2 \theta + b \sin \theta + c = 0$ , where  $a$ ,  $b$  and  $c$  are integers to be found. [3]

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- (b) Hence solve the equation  $\cos 2x (7 \tan 2x - 5 \cos 2x) = 1$  for  $0^\circ < x < 180^\circ$ . [3]

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5 The equation of a curve is  $y = 2x^2 - \frac{1}{2x} + 3$ .

(a) Find the coordinates of the stationary point.

[3]

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(b) Determine the nature of the stationary point.

[2]

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(c) For positive values of  $x$ , determine whether the curve shows a function that is increasing, decreasing or neither. Give a reason for your answer.

[2]

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6 A curve passes through the point  $\left(\frac{4}{5}, -3\right)$  and is such that  $\frac{dy}{dx} = \frac{-20}{(5x-3)^2}$ .

(a) Find the equation of the curve.

[4]

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(b) The curve is transformed by a stretch in the  $x$ -direction with scale factor  $\frac{1}{2}$  followed by a translation of  $\begin{pmatrix} 2 \\ 10 \end{pmatrix}$ .

Find the equation of the new curve.

[3]

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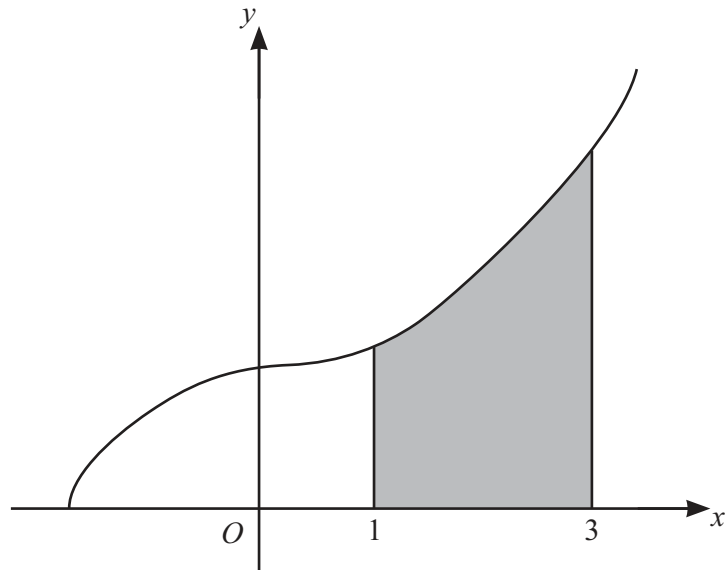
(a) Find the common difference. [2]

[illegible]

This image shows a full page of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for handwriting practice. There are no margins, text, or other markings on the page.

[illegible]

This image shows a full page of primary-ruled paper. It features approximately 20 horizontal dotted lines spaced evenly down the page, providing a guide for handwriting practice. The background is white, and there are no margins or other markings present.



The diagram shows the curve with equation  $y = \sqrt{2x^3 + 10}$ .

- (a) Find the equation of the tangent to the curve at the point where  $x = 3$ . Give your answer in the form  $ax + by + c = 0$  where  $a$ ,  $b$  and  $c$  are integers. [5]

[illegible]



- Find the volume of the solid obtained when the shaded region is rotated through  $360^\circ$  about the  $x$ -axis. [3]

[illegible]



- 10 The geometric progression  $a_1, a_2, a_3, \dots$  has first term 2 and common ratio  $r$  where  $r > 0$ .  
It is given that  $\frac{9}{2}a_5 + 7a_3 = 8$ .

(a) Find the value of  $r$ . [3]

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(b) Find the sum of the first 20 terms of the geometric progression. Give your answer correct to 4 significant figures. [2]

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[3]

[illegible]

(a) By completing the square, find the range of  $f$ . [3]

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1

- Determine the coordinates of  $P$ .

[illegible]

If you use the following page to complete the answer to any question, the question number must be clearly shown.

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.

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