



Cambridge International AS & A Level

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MATHEMATICS**9709/15**

Paper 1 Pure Mathematics 1

October/November 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 **20** pages. Any blank pages are indicated.

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1 A circle has centre $(2, 6)$ and radius 10.

(a) State the equation of the circle.

[2]

[illegible]

(b) The circle passes through the point $(8, k)$.

Find the two possible values of k .

[3]

[illegible]



2 A geometric progression has first term $3 + 4\sqrt{2}$ and second term $5 - \sqrt{2}$.

- (a) Find the common ratio of the geometric progression. Give your answer in the form $\sqrt{2} + p$, where p is an integer to be found. [3]

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- (b) Find the sum to infinity of the geometric progression. [2]

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- 3 (a) Express $4x^2 + 10x + 6$ in the form $a(x+b)^2 + c$, where a , b and c are rational constants to be determined. [2]

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- (b) The curve with equation $y = 4x^2 + 10x + 6$ and the line $y = k$ have exactly one point of intersection.

Using your answer to part (a) or otherwise, state the value of the constant k . [1]

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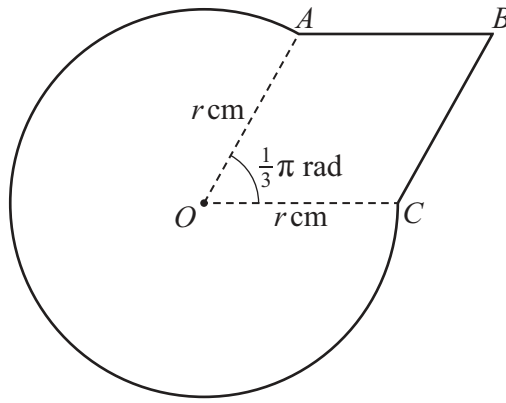
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The diagram shows the design for a company's new logo. The sector of the circle, centre O , has radius r cm. The acute angle $AOC = \frac{1}{3}\pi$ radians. The quadrilateral $OABC$ is a rhombus.

- (a) Find an expression for the perimeter of the design. Give your answer in terms of π and r . [2]

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- (b)** It is now given that the perimeter of the design is 200 cm.

Find the area of the design. Give your answer to 3 significant figures. [5]

This image shows a full page of white paper with horizontal dashed lines, typical of primary school handwriting practice 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.



5 Solve the equation

$$x^3 - 28 + \frac{27}{x^3} = 0.$$

[3]





6 (a) Show that the equation

$$6 \sin \theta + \frac{1}{\tan \theta} = \frac{4}{\sin \theta}$$

can be written in the form

$$6 \cos^2 \theta - \cos \theta - 2 = 0. \quad [3]$$

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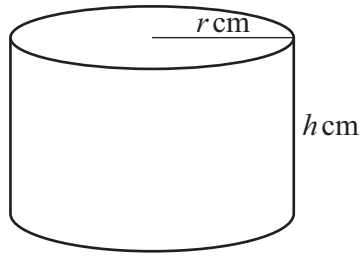
(b) Hence, solve the equation

$$6 \sin \theta + \frac{1}{\tan \theta} = \frac{4}{\sin \theta}$$

for $0^\circ \leq \theta \leq 360^\circ$.

[4]





A manufacturer wishes to design an open cylindrical tank, as shown in the diagram. The tank will have a base but no top. The outside of the tank will have a fixed surface area of $600\pi \text{ cm}^2$. The radius $r \text{ cm}$ and height $h \text{ cm}$ of the tank can vary.

- (a)** Show that the volume, $V \text{ cm}^3$, of the tank is given by

$$V = \frac{\pi r(600 - r^2)}{2}.$$

[3]





(b) Find the exact value of r which corresponds to the maximum value of V .

[3]

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(c) Hence, find the maximum value of V .

[2]

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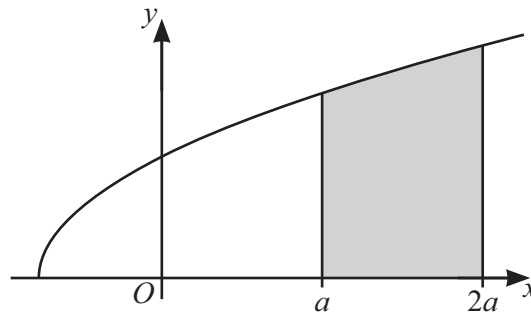
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The diagram shows the curve with equation $y = \sqrt{6x+5}$. The shaded region is bounded by the curve, the x -axis and the lines $x = a$ and $x = 2a$, where a is a positive constant.

The shaded region is rotated through 360° about the x -axis to form a solid. The solid has volume, V , such that $V \geq 46\pi$.

- (a) Show that $9a^2 + 5a - 46 \geq 0$. [4]

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- (b) Find the range of possible values of a . [3]

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- 9 In the expansion of $(p + qx)^4$, the coefficient of x is equal to the coefficient of x^2 . The constants p and q are both positive.

(a) Find the ratio $p : q$. Give your answer in its simplest form. [3]

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(b) It is given that the coefficient of x^3 is 486.
Find the values of p and q . [4]

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10 The function f is defined by

$$f(x) = 3 + \frac{7}{x-2}$$

for $x > 2$.

(a) It is given that $f(a) = 4$.

Find the value of a .

[2]

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(b) Find an expression for $f^{-1}(x)$ and state the domain of f^{-1} .

[4]

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(c) The function g is defined by

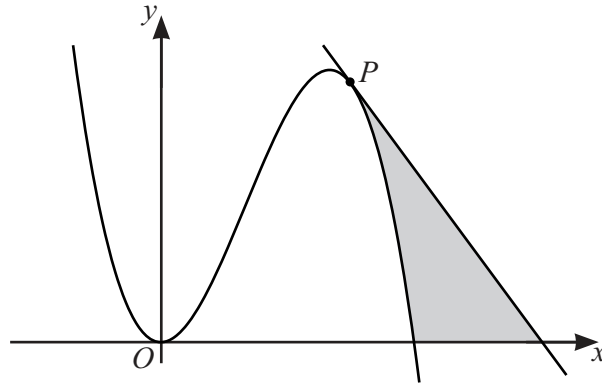
$$g(x) = \frac{1+4x}{2x-3}$$

for $x > \frac{3}{2}$.

Show that $\text{fg}(x) \equiv kx$, where k is a constant to be determined.

[3]

[illegible]



The diagram shows the curve with equation $y = 4x^2 - x^3$ and the tangent to the curve at the point P . The point P has x -coordinate 3.

- (a) Find the equation of the tangent to the curve at the point P . Give your answer in the form $y = mx + c$. [5]

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- (b)** The shaded region is bounded by the curve, the x -axis and the tangent to the curve at P .

Find the exact area of the shaded region.

[6]

[illegible]

The graph of $y = 4x^2 - x^3$ is transformed by a stretch of scale factor $\frac{1}{3}$ in the x -direction. The point Q is the image of P under this transformation. The transformed shaded region is bounded by the transformed curve, the x -axis and the tangent to the transformed curve at Q .

- (c) (i) Find the equation of the transformed curve in the form $y = mx^2 + nx^3$, where m and n are integers to be found. [1]

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- (c) (ii) State the coordinates of Q and the area of the transformed shaded region. [2]

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