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International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

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MATHEMATICS **9709/15**

Paper 1 Pure Mathematics 1 **May/June 2026**

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. Do **not** use correction fluid or tape.
- 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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1 Solve the simultaneous equations

$$4x^2 + 2y^2 - 3y = 21 \quad \text{and} \quad 2x - y - 5 = 0.$$ [5]

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2 A tank is being filled with water at a rate of $200\,\text{cm}^3\,\text{s}^{-1}$. The volume of water in the tank, $V\,\text{cm}^3$, is given by

$$V = 100\pi h + \frac{1}{3}\pi h^3,$$

where h is the height of water in the tank in centimetres.

Find the exact rate at which h is increasing when $h = 30$. [3]

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3 The coefficient of x^4 in the expansion of $(p+2x)^5$ is equal to the coefficient of x^2 in the expansion of $(1-2qx)^4$, where p and q are constants.

(a) Find an expression for p in terms of q. [3]

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(b) Given that $p = \frac{6}{5}$, find the two possible values of the coefficient of x^3 in the expansion of $(3+qx)^6$. [3]

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4 The equation of a curve is $y = -4x^2 + 2x + 3$.

(a) Use differentiation to find the x-coordinate of the stationary point of the curve. [2]

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The curve is stretched by factor 3 in the y-direction and then by factor $\frac{1}{2}$ in the x-direction.

(b) Find the x-coordinate of the stationary point of the transformed curve. [1]

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(c) Find the equation of the transformed curve. Give your answer in the form $y = ax^2 + bx + c$, where a, b and c are integers to be found. [3]

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5 **(a)** Express $2x^2 - 16x - 18$ in the form $2(x+a)^2 + b$, where a and b are constants to be found. [2]

(b) Hence, solve the equation $2x^8 - 16x^4 - 18 = 0$. [4]

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6 Find the set of values of k for which the line $y + 4x = k$ and the curve with equation $y = 4 - 7x - 2x^2$ have at least one point of intersection. [4]

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7 **(a)** Prove the identity

$$\frac{\cos\theta}{1-\sin\theta} - \frac{1}{\cos\theta} \equiv \tan\theta.$$ [4]

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(b) Hence, solve the equation

$$\frac{2\cos\theta}{1-\sin\theta} - \frac{2}{\cos\theta} + 3 = 0$$

for $0° \leqslant \theta \leqslant 360°$. [3]

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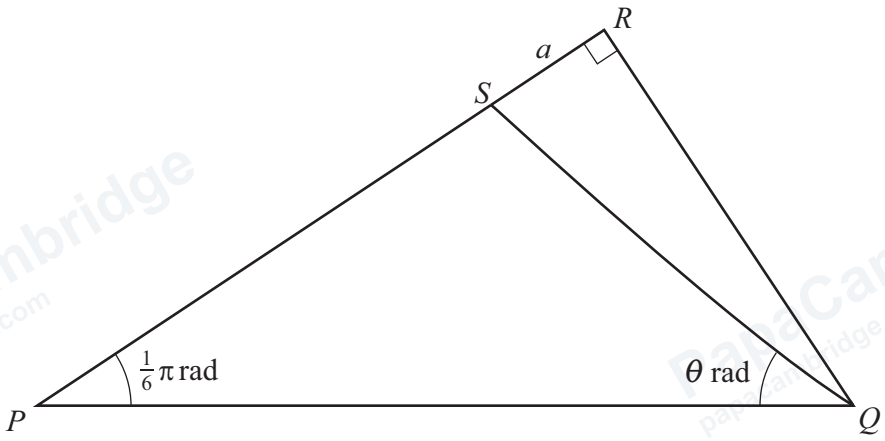

The diagram shows a right-angled triangle PQR. The point S lies on PR and is such that $PS = 4RS$. The distance $RS = a$. The angle $QPR = \frac{1}{6}\pi$ radians, and the angle $PQS = \theta$ radians.

(a) Find the exact distance QS in terms of a. Give your answer in the form $\sqrt{\frac{c}{d}}\,a$, where c and d are integers to be found. [2]

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(b) **(i)** Show that the angle $RQS = \sin^{-1}\left(\frac{\sqrt{21}}{14}\right)$. [2]

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(ii) Hence, find the exact value of θ. [1]

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9 A function f is defined by $f(x) = 3 - \frac{4}{2x+3}$ for $x > -\frac{3}{2}$.

(a) (i) Find $f'(x)$. [2]

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(ii) Hence, show that f is an increasing function. [1]

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(b) (i) Find an expression for $f^{-1}(x)$. [3]

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(ii) State the domain and range of f^{-1}. [2]

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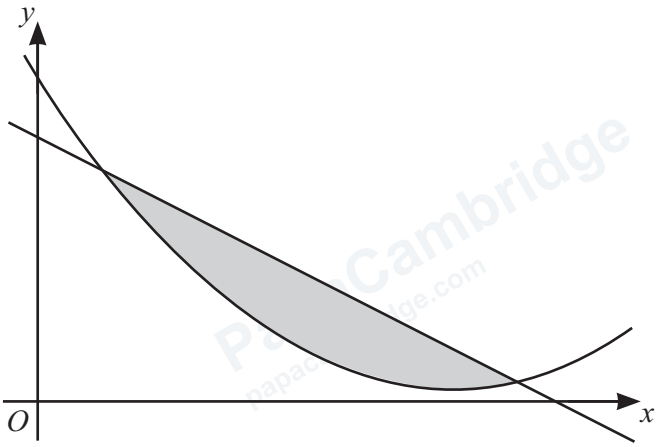

The diagram shows the curve with equation $y = x^2 - 12x + 37$ and the line $y = -4x + 30$.

Find the area of the shaded region. [7]

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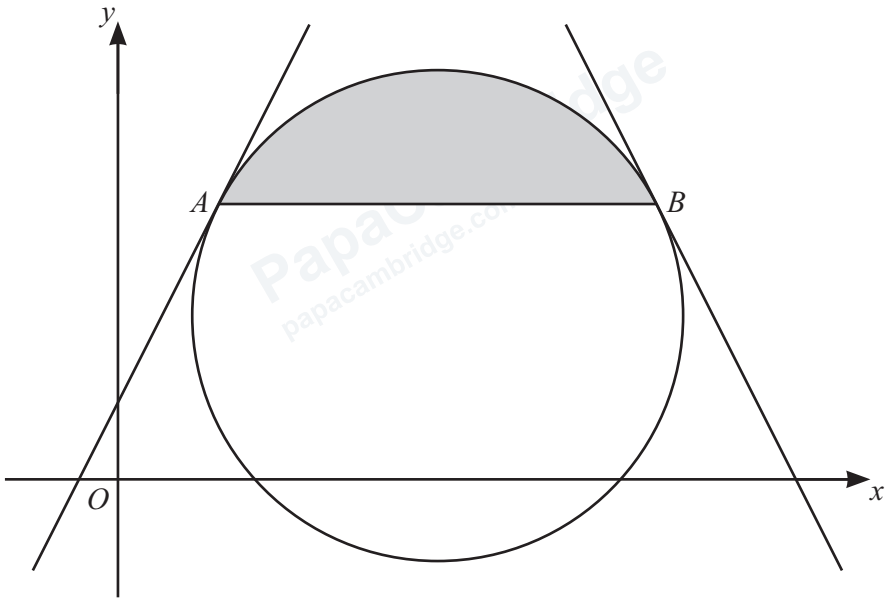

In the diagram, AB is a chord of the circle with equation $(x-6)^2+(y-3)^2=20$. The two tangents to the circle with equations $y=2x+1$ and $y=-2x+25$ meet the circle at the points A and B respectively.

(a) Find the coordinates of the points A and B. [4]

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(b) Hence, or otherwise, find the area of the shaded region. Give your answer to 3 significant figures. [5]

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12 **(a)** The first term of an arithmetic progression is 5730 and the common difference is –23.

Find the value of the first negative term. [3]

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(b) The first term of a geometric progression is $\sin\theta$ and the second term is $\frac{1}{2}\tan\theta$, where $0 < \theta < \frac{1}{2}\pi$.

(i) Find the set of values of θ for which the progression is convergent. [3]

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(ii) Given that $\theta = \frac{1}{6}\pi$, find the sum to infinity of the progression. Give your answer in the form $\frac{p+\sqrt{q}}{r}$, where p, q and r are integers to be found. [3]

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