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CAMBRIDGE
International Education

Cambridge International AS & A Level

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

MATHEMATICS **9709/13**

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. Any blank pages are indicated.

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[Turn over

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1 **(a)** Find the coordinates of the points of intersection of the curve $y = 3x^2 - 12x + 17$ and the line $y = 6x + 2$. [4]

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(b) Hence, solve $6x + 2 \geqslant 3x^2 - 12x + 17$. [1]

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2 **(a)** Express $x\sqrt{x}$ in the form x^n, where n is a rational number. [1]

(b) Hence, solve the equation

$$x^3 - 9x\sqrt{x} + 8 = 0.$$ [3]

3 **(a)** Prove the identity

$$\frac{1}{\cos\theta} - \cos\theta \equiv \tan\theta \sin\theta.$$ [3]

(b) Hence, solve the equation

$$\frac{2}{\cos\theta} - 2\cos\theta = \tan\theta$$

for $0° \leqslant \theta \leqslant 360°$. [4]

4 The equation of a curve is

$$y = 3x - kx^3 + 4,$$

where k is a constant. The point P on the curve has x-coordinate 1. The normal to the curve at P is parallel to the straight line $3y = x$.

(a) Find the value of k. [3]

(b) The point Q is also on the curve. The normal to the curve at Q is also parallel to the line $3y = x$.

Find the coordinates of the point Q. [4]

5 **(a)** Find the first four terms, in ascending powers of x, in the expansion of $(2+3x)^5$. [3]

(b) Hence, find the expansion up to and including the term in x^3 of $(1-3x)(2+3x)^5$. [2]

(c) Use your answer to **5(b)**, with a suitable value of x, to find an approximation to 0.97×2.03^5. Write down your answer to 5 decimal places. [3]

6 The function f is defined by $f(x) = \dfrac{16}{x^3} + 3x + 5$ for $x \neq 0$.

(a) Find the coordinates of all stationary points on the curve $y = f(x)$. [4]

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(b) The function g is defined by $g(x) = f(x) + a$ where a is a constant. It is given that $g(-x) \equiv -g(x)$.

Find the value of a. [3]

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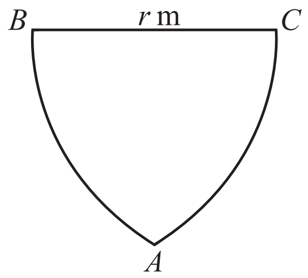

The diagram shows the design for a garden. The points A, B and C form the vertices of an equilateral triangle of side length r metres. The arcs AC and AB are parts of circles with centres B and C respectively and are both of radius r metres.

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

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(b) Given that $r = 18$, find the exact area of the garden. Give your answer in terms of π and $\sqrt{3}$. [4]

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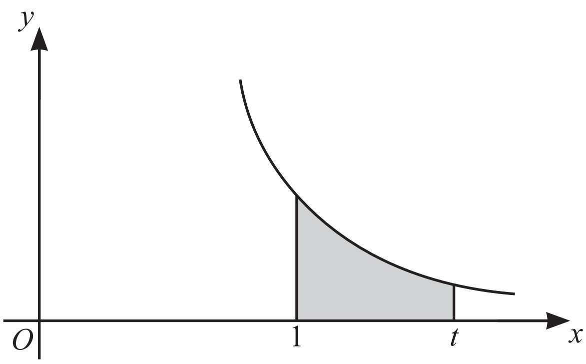

The diagram shows part of the curve with equation $y = \dfrac{2}{5x^3}$.

The shaded region is bounded by the curve, the x-axis and the lines $x = 1$ and $x = t$. It is given that the area of the shaded region is $\frac{1}{9}$.

Find the value of t. [5]

9 The equation of a curve is $y = \sqrt{3x+1}$.

(a) Find $\dfrac{dy}{dx}$. [2]

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(b) A point P is moving along the curve such that its x-coordinate is increasing at a rate of 6 units per second.

Find the rate at which the y-coordinate of P is changing when $y = 4$. [5]

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10 The first, second and third terms of a geometric progression are equal to the first, fourth and sixth terms of an arithmetic progression respectively. The first term of both progressions is non-zero. The geometric progression has common ratio r.

(a) Show that

$$3r^2 - 5r + 2 = 0.$$ [3]

(b) It is given that the sum to infinity of the geometric progression is 54.

Find the common difference of the arithmetic progression. [4]

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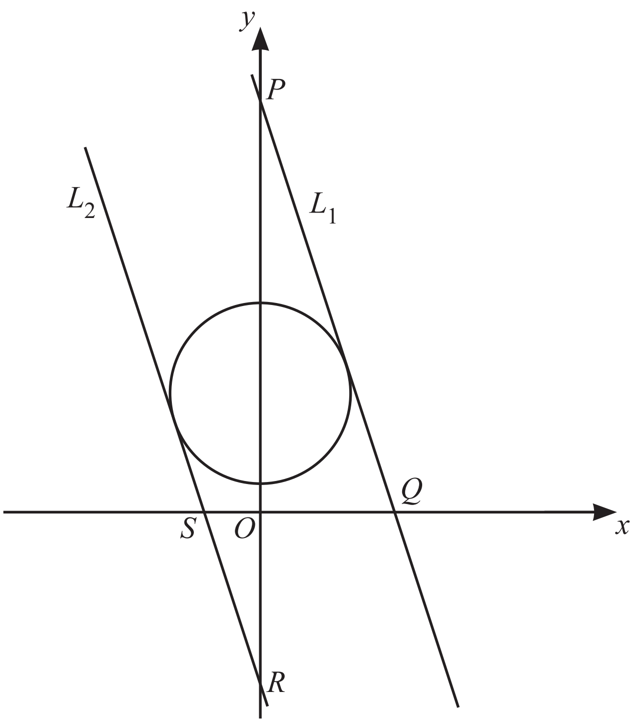

The diagram shows a circle with two tangents, L_1 and L_2. The tangent L_1 intersects the x-axis at Q and the y-axis at P. The tangent L_2 intersects the x-axis at S and the y-axis at R.

(a) The end-points of a diameter of the circle are $\left(0,\ 4-\sqrt{10}\right)$ and $\left(0,\ 4+\sqrt{10}\right)$.

Show that the equation of the circle can be expressed as

$$x^2+y^2-8y+6=0.$$ [3]

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(b) The two tangents, L_1 and L_2, have equations of the form $y = -3x + c$.

Show that $c^2 - 8c - 84 = 0$. [4]

(c) Find the exact area of quadrilateral *PQRS*. [5]

Additional page

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