* 0000800000001 *

Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

0638367087

ADDITIONAL MATHEMATICS **4037/11**

Paper 1 Non-calculator **May/June 2025**

2 hours

You must answer on the question paper.

No additional materials are needed.

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.
- Calculators must **not** be used in this paper.
- You must show all necessary working clearly.

INFORMATION
- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages.

[Turn over

List of formulas

Equation of a circle with centre (a, b) and radius r. $(x-a)^2+(y-b)^2=r^2$

Curved surface area, A, of cone of radius r, sloping edge l. $A=\pi rl$

Surface area, A, of sphere of radius r. $A=4\pi r^2$

Volume, V, of pyramid or cone, base area A, height h. $V=\frac{1}{3}Ah$

Volume, V, of sphere of radius r. $V=\frac{4}{3}\pi r^3$

Quadratic equation

For the equation $ax^2+bx+c=0$,

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

Binomial theorem

$$(a+b)^n=a^n+\binom{n}{1}a^{n-1}b+\binom{n}{2}a^{n-2}b^2+\ldots+\binom{n}{r}a^{n-r}b^r+\ldots+b^n,$$

where n is a positive integer and $\binom{n}{r}=\frac{n!}{(n-r)!\,r!}$

Arithmetic series

$$u_n=a+(n-1)d$$
$$S_n=\frac{1}{2}n(a+l)=\frac{1}{2}n\{2a+(n-1)d\}$$

Geometric series

$$u_n=ar^{n-1}$$
$$S_n=\frac{a(1-r^n)}{1-r}\quad(r\neq 1)$$
$$S_\infty=\frac{a}{1-r}\quad(|r|<1)$$

Identities

$$\sin^2 A+\cos^2 A=1$$
$$\sec^2 A=1+\tan^2 A$$
$$\operatorname{cosec}^2 A=1+\cot^2 A$$

Formulas for ΔABC

$$\frac{a}{\sin A}=\frac{b}{\sin B}=\frac{c}{\sin C}$$
$$a^2=b^2+c^2-2bc\cos A$$
$$\Delta=\frac{1}{2}ab\sin C$$

Calculators must **not** be used in this paper.

1 **(a)** Given that $\overrightarrow{PQ} = \begin{pmatrix} -3 \\ 7 \end{pmatrix}$ and $4\overrightarrow{PR} = \begin{pmatrix} -2 \\ 8 \end{pmatrix}$, find $\overrightarrow{RQ}$. [2]

(b) The vectors **a**, **b** and **c** are such that $\mathbf{a} = \alpha\mathbf{i} + 6\mathbf{j}$, $\mathbf{b} = 4\mathbf{i} + \beta\mathbf{j}$ and $\mathbf{c} = (2\alpha + 5\beta)\mathbf{i} + 20\mathbf{j}$, where α and β are scalars.

Given that $\mathbf{c} = 3\mathbf{a} - 2\mathbf{b}$, find the values of α and β. [3]

2 Solve the inequality $(3-x)(5x+8) \geqslant 9-3x$. [4]

3 Point A has coordinates $(3, -1)$.

A circle has equation $(x-4)^2 + (y+3)^2 = 5$.

(a) Show that A lies on the circumference of the circle. [1]

(b) Given that AB is a diameter of the circle, find the coordinates of B. [2]

(c) Find the equation of the tangent to the circle at A. [3]

4 **(a)** Solve the equation $x^{\frac{1}{3}} - x^{\frac{1}{6}} = 2$. [4]

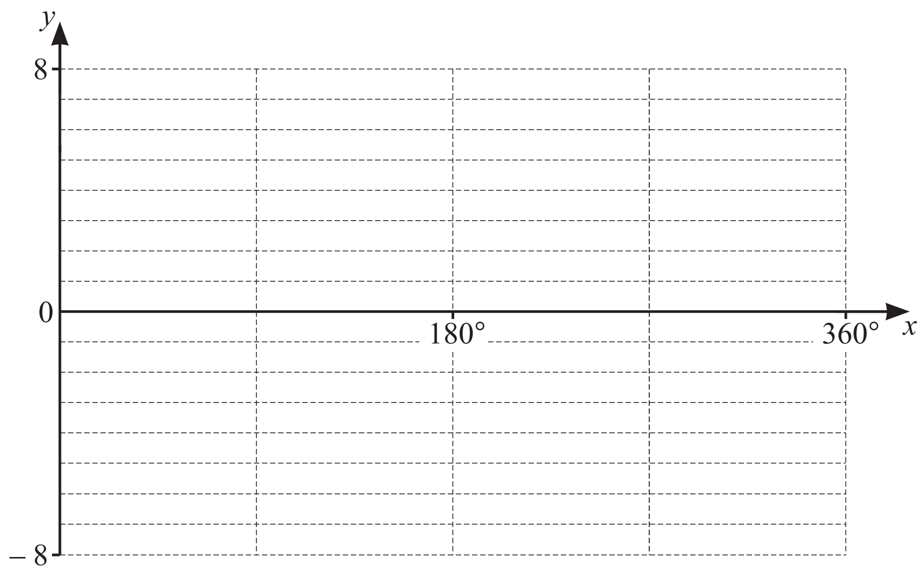
(b) Solve the simultaneous equations

$$\lg(x+2y) = 0$$
$$x^2 + 4xy + y = 1.$$

[5]

5 **(a)** Solve the equation $5|2x-1|+8=23$. [3]

(b) On the axes, sketch the graph of $y=5\sin x-2$ for $0° \leqslant x \leqslant 360°$. [2]



6 A curve has equation $y = \left(\dfrac{x^2 - 1}{x^2 + 1}\right)^4$.

(a) Show that $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ can be written as $\dfrac{Ax\left(x^2 - 1\right)^3}{\left(x^2 + 1\right)^5}$, where A is a positive integer to be found. [5]

(b) **(i)** Show that the curve has stationary points where $x = -1$, $x = 0$ and $x = 1$. [1]

(ii) Use the first derivative test to determine which two stationary points have the same nature and state whether they are maximum or minimum points. [2]

7 **Solutions to this question by accurate drawing will not be accepted.**

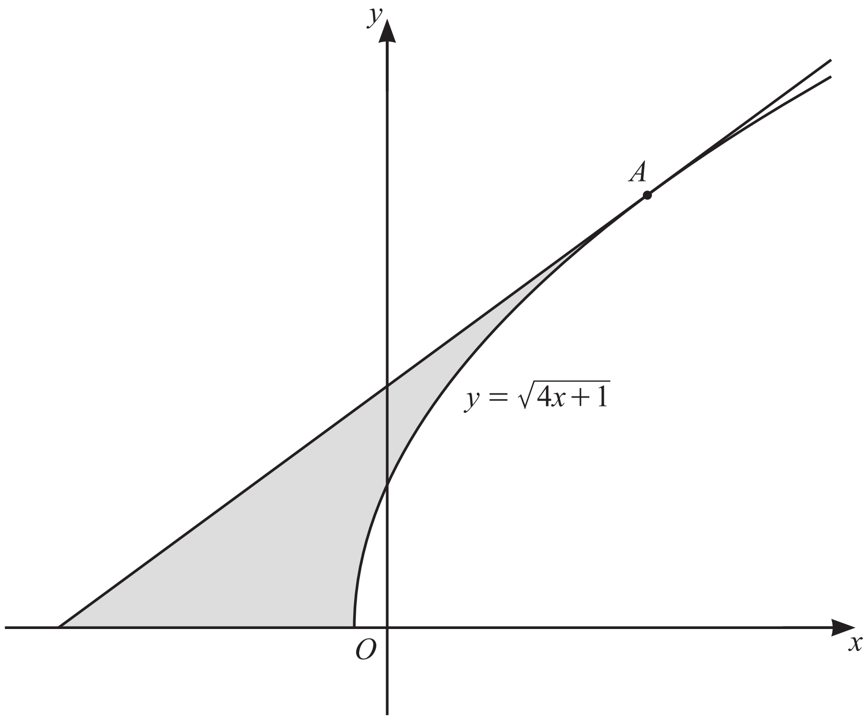
Find the x-coordinates of the points where the curve $y = (2x-9)\left(x^2+5\right)+42$ cuts the x-axis. [6]

DO NOT WRITE IN THIS MARGIN

8 **(a)** Write down the set of values of x for which $\log_5(12x-4)$ exists. [1]

(b) Solve the equation $\log_5(12x-4) = \dfrac{6}{\log_x 125} + 1$. [6]

9



The point A with x-coordinate 2 lies on the curve $y = \sqrt{4x+1}$.
The diagram shows part of this curve and the tangent to the curve at A.

Find the area of the shaded region enclosed by the curve, the tangent and the x-axis. [10]

Continuation of working space for Question 9.

10 **(a)** Given that $0 \leqslant \theta < \frac{\pi}{2}$, show that $\dfrac{\sin\theta}{\sqrt{\operatorname{cosec}^2\theta - 1}} + \dfrac{1}{\sqrt{1+\tan^2\theta}}$ can be written as $\sec\theta$. [4]

(b) Given that $\sec x = \alpha$, where $\frac{3\pi}{2} < x \leqslant 2\pi$, find $\sin x$ in terms of α. [3]

11 An arithmetic progression has common difference d.
The 3rd term of this progression is 10.

(a) Write down expressions for the 1st term and the 2nd term of this progression.
Give your answers in terms of d only. [2]

(b) When each of the first 3 terms is squared, the sum of these squares is 140 .
There are two possible values for d.

Using your answer to part **(a)**, find the sum of the first 200 terms of the progression with the smaller value of d. [7]

Question 12 is printed on the next page.

12 In this question $n \geqslant 6$.
Use an algebraic method to show that ${}^{n}C_5 - {}^{n-1}C_5$ can be written as ${}^{n-1}C_4$. [4]