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Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2322594142

ADDITIONAL MATHEMATICS **4037/12**

Paper 1 Non-calculator **October/November 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.

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[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

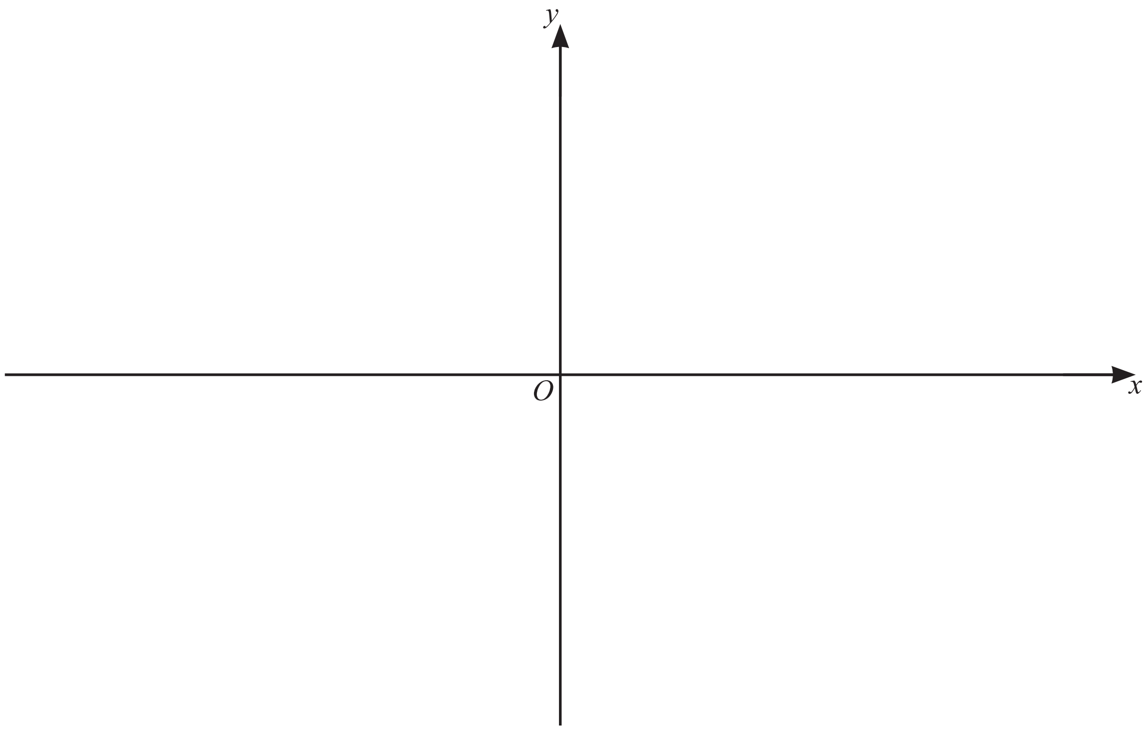
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\Delta = \frac{1}{2}ab \sin C$$

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

1 **(a)** On the axes, sketch the graph of $y = (1-x)(x-5)(2x-5)$, stating the intercepts with the axes. [3]



(b) Hence solve the inequality $(1-x)(x-5)(2x-5) \leqslant 0$. [2]

2 The polynomial p is such that $p(x) = 2x^3 + ax^2 + 13x + b$, where a and b are integers.
It is given that $x + 2$ is a factor of $p(x)$.
When $p(x)$ is divided by $x + 1$ there is a remainder of 6.

(a) Find the values of a and b. [4]

(b) Show that the equation $p(x) = 0$ has only one real root. [3]

3 The sum of the first two terms of a geometric progression is 9.
The sum to infinity of this geometric progression is 25.

(a) Find the possible values of the common ratio of this geometric progression. [4]

(b) Find the first term of this geometric progression for each possible value of the common ratio. [2]

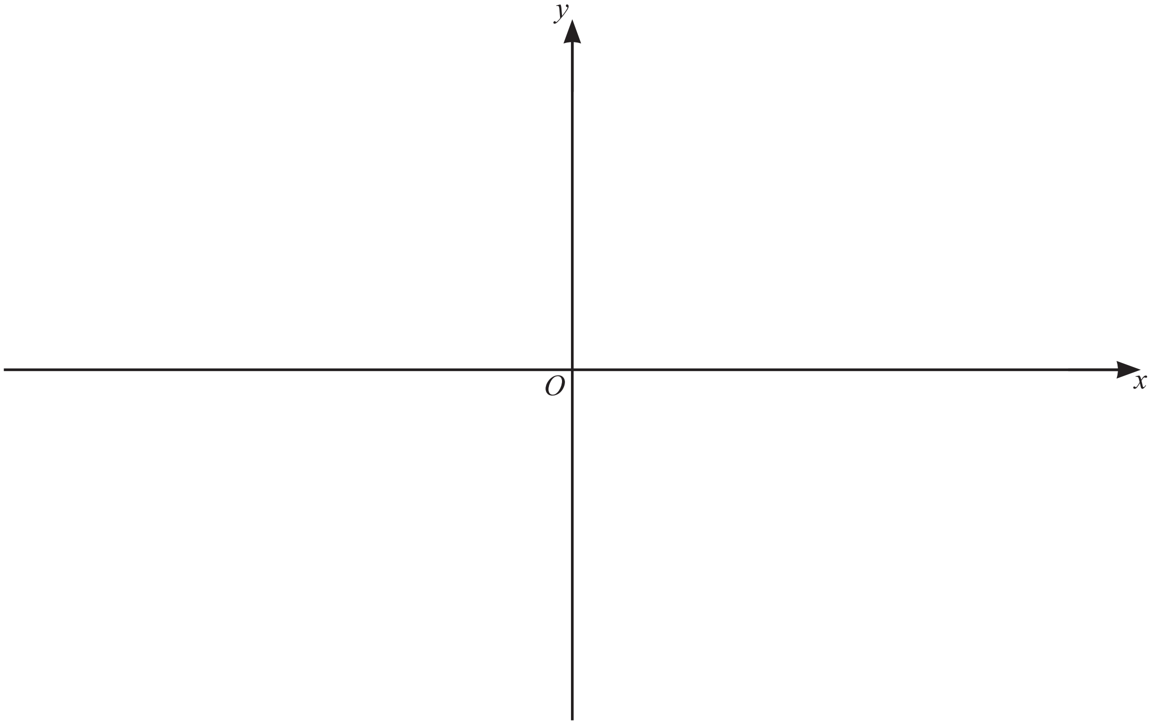
4 **(a)** Show that $2x^2+5x+3$ can be written in the form $2(x+a)^2+b$, where a and b are constants to be found. [2]

(b) Hence write down the coordinates of the stationary point on the curve $y=2x^2+5x+3$. [2]

A function f is such that $f(x)=2x^2+5x+3$, for $x \geqslant p$, where p is a constant.
It is given that f^{-1} exists.

(c) **(i)** Write down the least possible value of p. [1]

(ii) Using your value of p, sketch the graphs of $y = \mathrm{f}(x)$ and $y = \mathrm{f}^{-1}(x)$.
Label each graph.
State the intercepts of each of the graphs with the axes. [5]



5 **(a)** Write $5\lg a - 4\lg b - 3$ as a single base 10 logarithm. [3]

(b) Solve the equation $\log_5(x+1) - \log_{(x+1)}5 = 0$. [4]

6 Solve the equation $|2x^2 + x - 10| = 5$. [5]

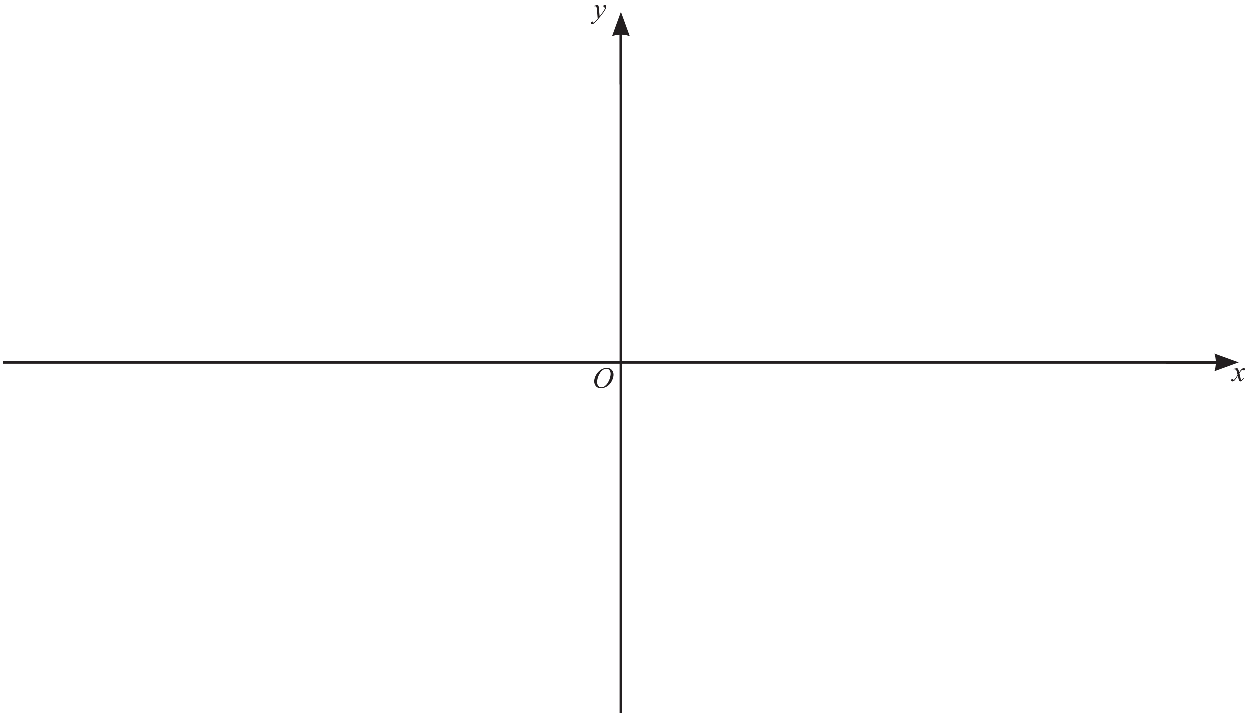
7 The point A has coordinates $(-2, 4)$.
The point B has coordinates $(6, 10)$.
The point C has coordinates $(12, 2)$.

(a) Find the gradients of the lines AB, AC and BC. [2]

(b) Hence find the equation of the circle which passes through the points A, B and C. [4]

8 On the axes, sketch the graph of $y = 5\ln(4x + 3)$.
State the intercepts with the axes.
State the equation of any asymptote.

[4]



9 A curve $y = \mathrm{f}(x)$ is such that $\mathrm{f}''(x) = (2x+5)^{-\frac{3}{2}}$.

The curve has gradient $\frac{2}{3}$ at the point (2, 2).

(a) Find the coordinates of the stationary point on the curve. [11]

Continuation of working space for Question 9(a).

(b) Determine the nature of this stationary point. [1]

10 Show that $\int_{\frac{\pi}{2}}^{\frac{3\pi}{2}} \left((\sin\theta + \cos\theta)^2 + (\sin\theta - \cos\theta)^2\right) d\theta = k\pi$, where k is an integer to be found. [5]

11 Solve the equation $(n-4)\,{}^{n+1}C_5 = {}^{n+2}C_7$. [3]

12 A curve has equation $y = \frac{e^{(x^2)}}{x-2}$ for $x < 2$.

(a) Find the value of $\frac{dy}{dx}$ when $x = 0$. [4]

When $x = 0$, y is increasing at the rate of 0.5 units per second.

(b) Find the corresponding rate of change of x. [2]

Question 13 is printed on the next page.

13 For $-1 \leqslant x \leqslant 1$ it is given that $x = 2 - 3\sin\theta$ and $y = 3\cot^2\theta$.

Find y in terms of x. [4]