



Cambridge O Level

CANDIDATE
NAME

--

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--

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.

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 .

$$A = \pi r l$$

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

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

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 $\triangle ABC$

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

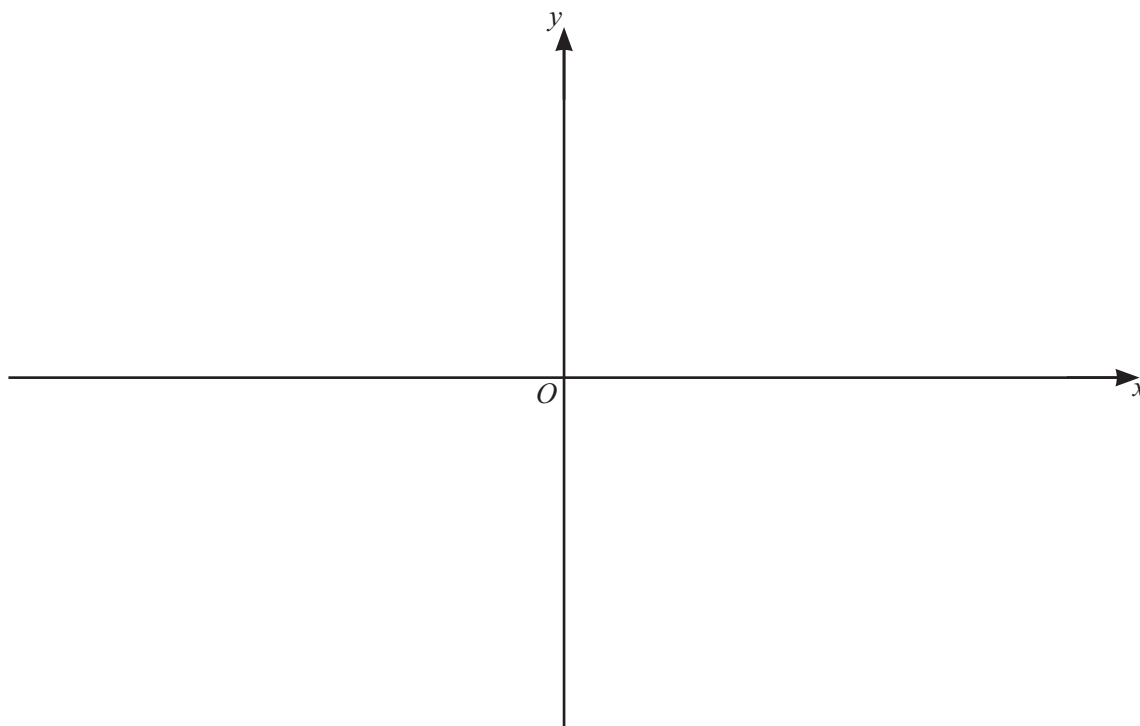
$$a^2 = b^2 + c^2 - 2bc \cos A$$

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



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 $(1-x)(x-5)(2x-5) \leq 0$. [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]

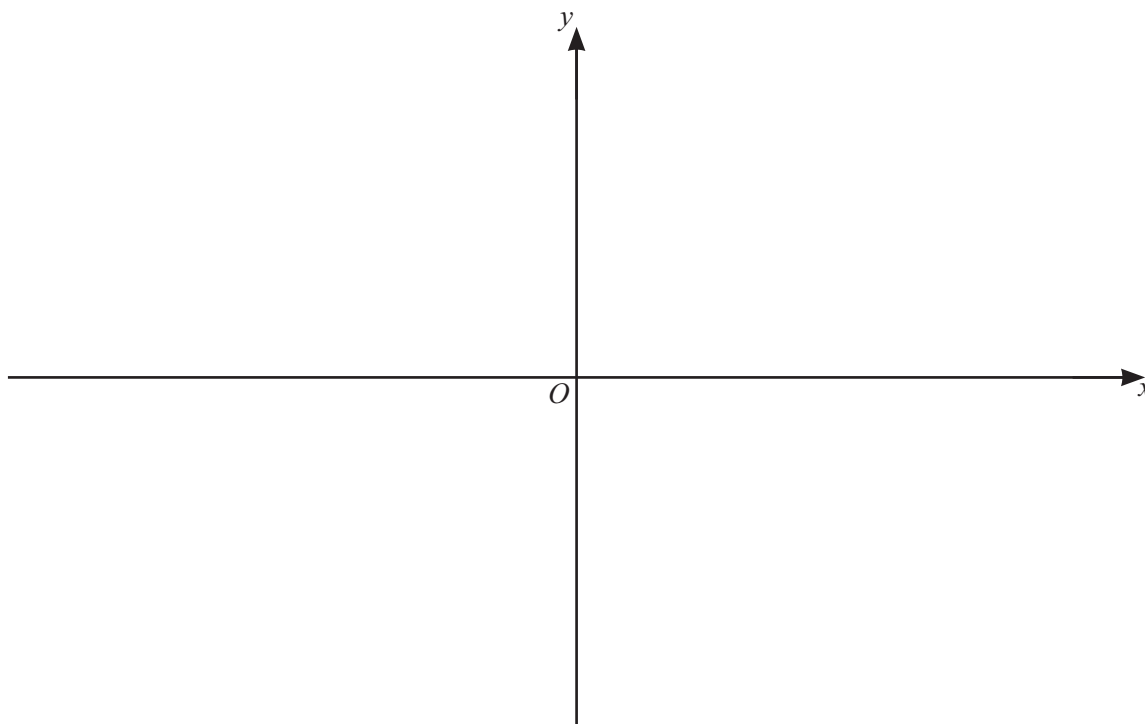
A function f is such that $f(x) = 2x^2 + 5x + 3$, for $x \geq p$, where p is a constant.
It is given that f^{-1} exists.

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



- (ii) Using your value of p , sketch the graphs of $y = f(x)$ and $y = f^{-1}(x)$.
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]

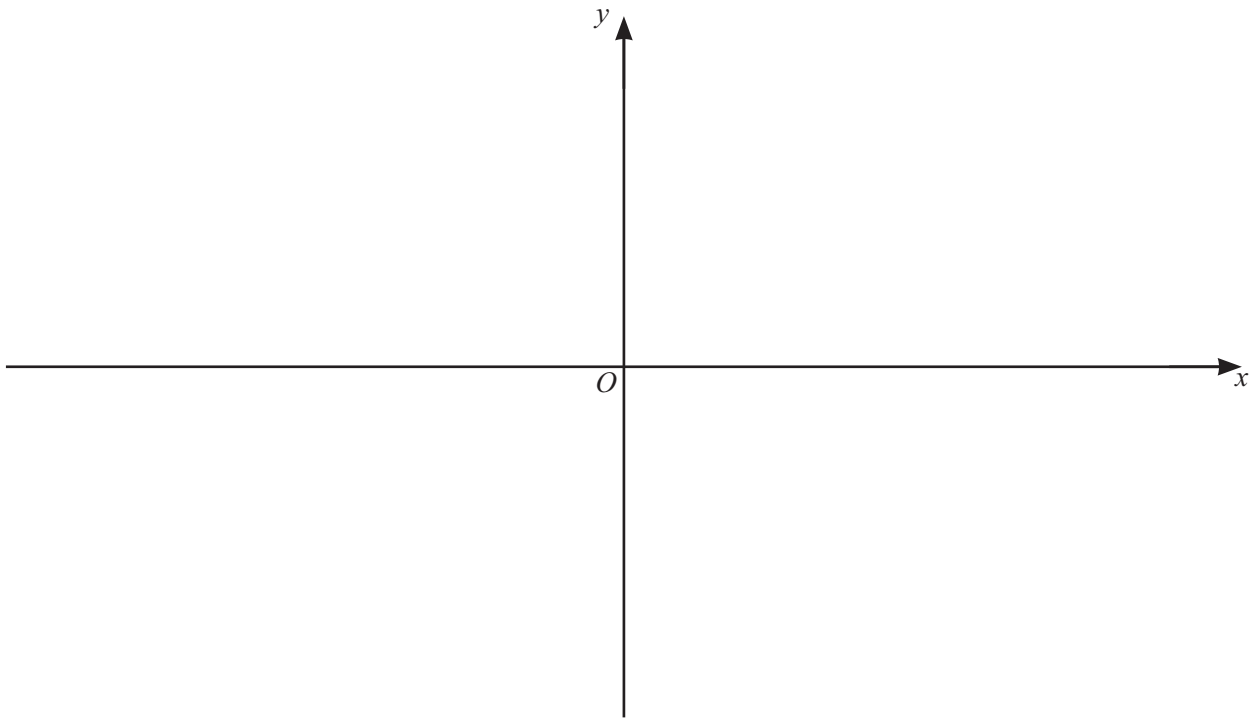
(b) Hence find the equation of the circle which passes through the points A , B and C .

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

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 $\int_{\frac{\pi}{2}}^{\frac{3\pi}{2}} ((\sin \theta + \cos \theta)^2 + (\sin \theta - \cos \theta)^2) d\theta = k\pi$, 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 $-1 \leq x \leq 1$ it is given that $x = 2 - 3 \sin \theta$ and $y = 3 \cot^2 \theta$.

Find y in terms of x .

[4]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.

