



Cambridge O Level

CANDIDATE
NAME

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CENTRE
NUMBER

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ADDITIONAL MATHEMATICS

4037/23

Paper 2

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.
- You should use a scientific calculator where appropriate.
- You must show all necessary working clearly.
- 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.
- For π , use either your calculator value or 3.142.

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 $\triangle ABC$

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

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

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



- 1 It is given that $p(x) = ax^3 - 7x^2 - bx + 9$, where a and b are constants.
 $x - 3$ is a factor of $p(x)$.
When $p(x)$ is divided by $x + 2$ the remainder is -35 .

Find the values of a and b .

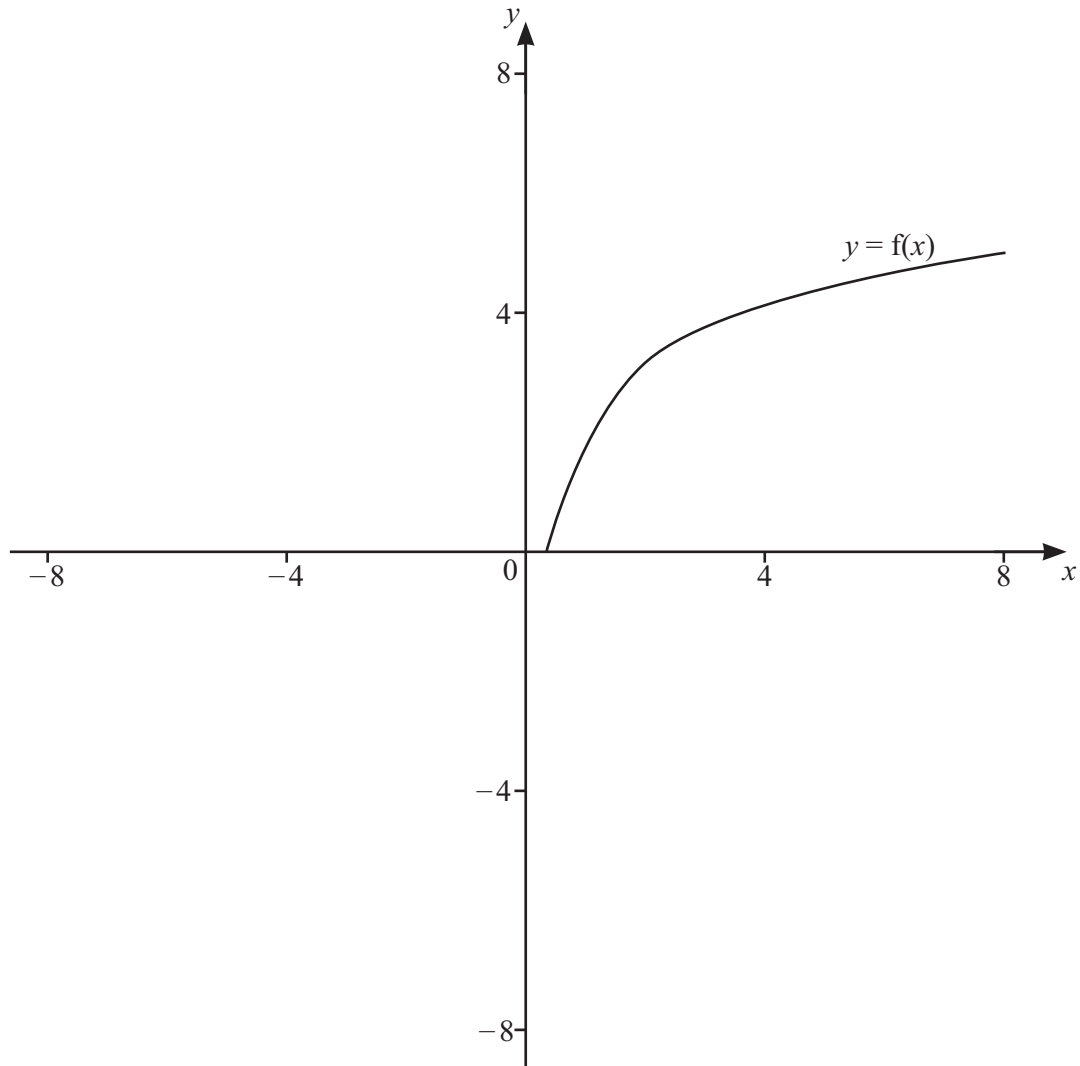
[5]





2

(a) (i)



The diagram shows the graph of $y = f(x)$.

On the same diagram sketch the graph of $y = f^{-1}(x)$.

[1]

(ii) Describe the relationship between the graph of $f(x)$ and the graph of $f^{-1}(x)$.

[1]





(b) A function g is defined by $g(x) = e^{\sqrt{x-2}}$ for $x \geq 2$.

(i) Find an expression for $g^{-1}(x)$.

[3]

(ii) Write down the range of g^{-1} .

[1]

(iii) A function h is defined by $h(x) = \frac{1}{x^2} + 2$ for $x > 0$.

Find an expression for $gh(x)$ in its simplest form.

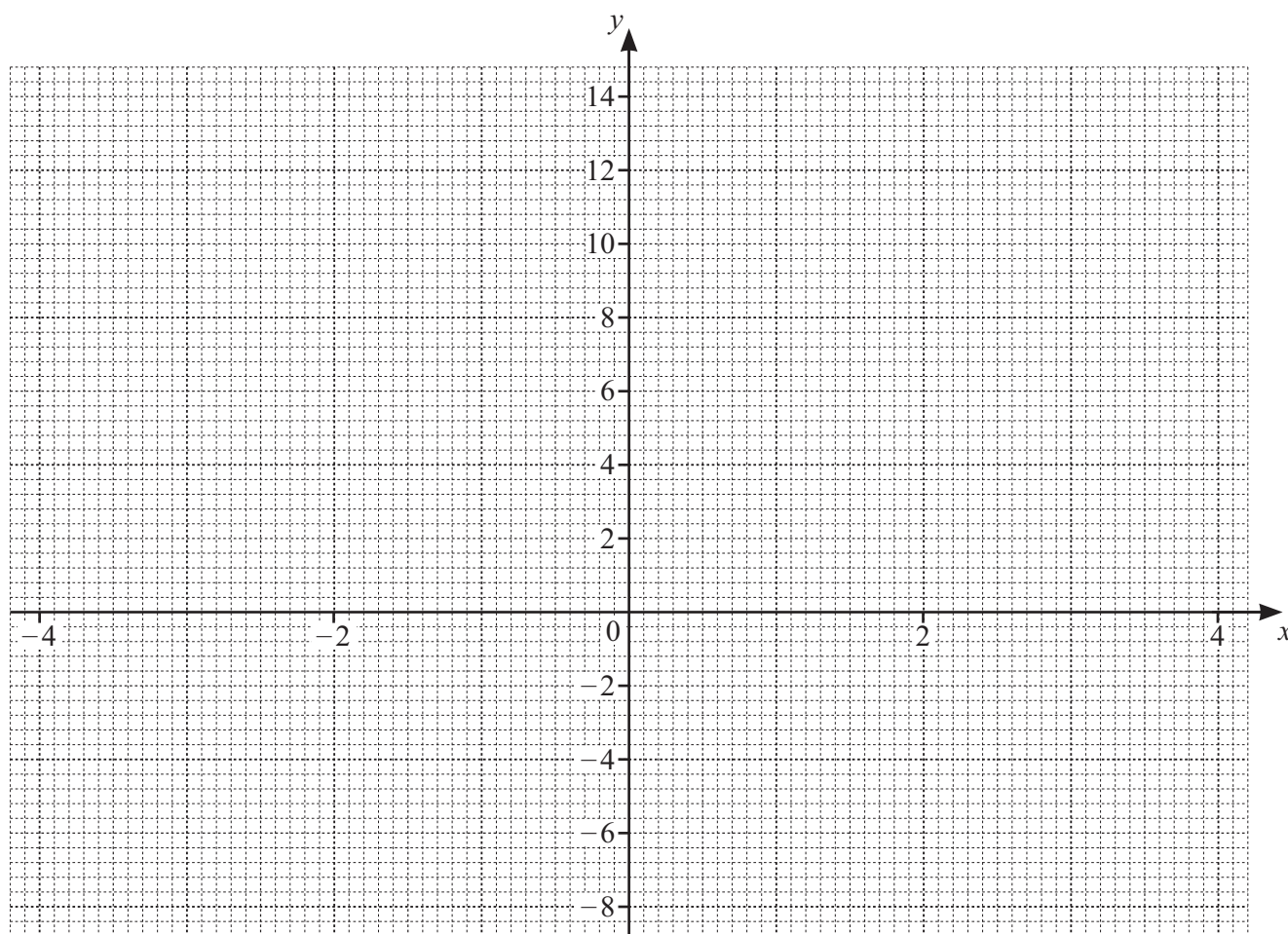
[2]



3 (a) (i) Write $x^2 - x - 6$ in the form $(x+a)^2 + b$ where a and b are constants. [2]

(ii) Hence write down the coordinates of the stationary point on the curve $y = x^2 - x - 6$. [2]

(b) On the axes, draw the graph of $y = |x^2 - x - 6|$ for $-4 \leq x \leq 4$. [3]



(c) Use your graph to solve the inequality $|x^2 - x - 6| < 4$. [2]



4 (a) Integrate the following with respect to x .

(i) e^{5x-2}

[2]

(ii) $\frac{1}{4-3x}$ where $x < \frac{4}{3}$

[2]

(b) Show that $\int_{\frac{\pi}{3}}^{\frac{\pi}{2}} \sec^2\left(\frac{1}{2}x\right)dx = 2\left(1 - \frac{\sqrt{3}}{3}\right)$.

[3]



- 5 Six different digits are chosen from the nine digits 1, 2, 3, 4, 5, 6, 7, 8, 9. These digits are used to form a 6-digit number. Find how many 6-digit numbers can be formed in the following cases.

(a) There are no restrictions.

[1]

(b) The number is greater than 700 000.

[2]

(c) The number is greater than 750 000.

[3]



- 6 The line $y = 3x + 4$ meets the curve $y = 2x^2 + 8x + 1$ at two points A and B .

Find the equation of the perpendicular bisector of AB , giving your answer in the form $ax + by + c = 0$, where a , b and c are integers. [9]



7 Solve the equation $\sec^2 3x + \tan 3x - 3 = 0$ for $0^\circ \leq x \leq 120^\circ$.

[6]

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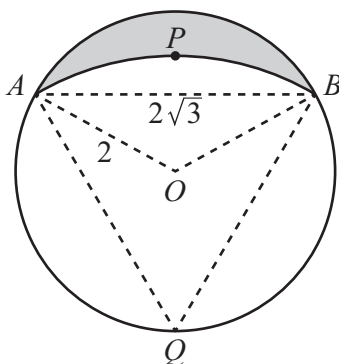
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8 In this question the units are metres.



The diagram shows a circle, centre O and radius 2 .
 The chord AB has length $2\sqrt{3}$.
 The point Q lies on the circle such that $AQ = BQ$.
 The arc APB is part of a circle, centre Q .

(a) Find the exact value of angle AQB in radians.

[2]

(b) Hence find the area of the shaded region. Give your answer in terms of π .

[6]

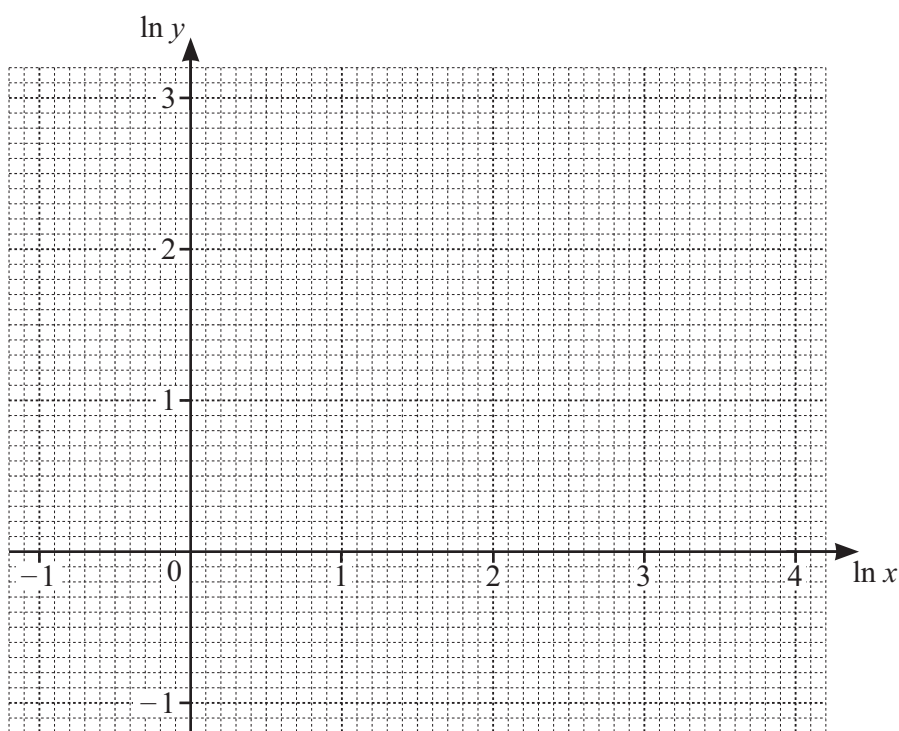


- 9 Two variables, x and y , are related by an equation of the form $y = Ax^b$, where A and b are constants. The following pairs of values of x and y are given.

x	0.61	4.48	12.18	33.1
y	1.65	4.47	7.39	12.17

- (a) On the axes below, use these values to draw the straight-line graph of $\ln y$ against $\ln x$.

[2]



(b) Use your graph to find the values of A and b .

[4]

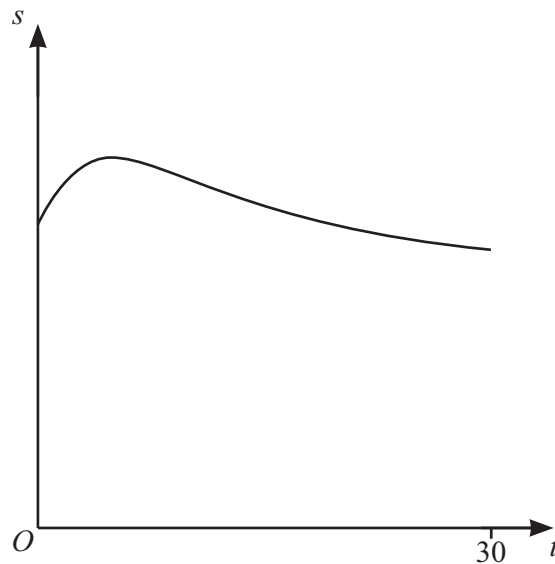


- 10 In this question the units are metres and seconds.

A particle moves along a straight line through a point A .

Its displacement, s , from A at time t is given by $s = \frac{10t + 100}{\sqrt{2t^2 + 100}}$.

The diagram shows the displacement–time graph for the first 30 seconds of the motion.



- (a) Find the value of t when s is a maximum.

[6]



(b) The particle passes through its starting point again at time $t = T$.

(i) Find the total distance travelled by the particle during the first T seconds of its motion. [2]

(ii) Use algebra to find T . [3]

Question 11 is printed on the next page.





- 11 A circle has equation $x^2 + y^2 - 25 = 0$.
A second circle has the same radius as the first circle, and the coordinates of its centre are both positive.
The two circles intersect at the points A and B .
The line AB has length 6 and is parallel to the line $y = -x$.

Find the equation of the second circle in the form $x^2 + y^2 + ax + by + c = 0$, where a , b and c are constants. [5]

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