



Cambridge O Level

CANDIDATE
NAMECENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--

ADDITIONAL MATHEMATICS**4037/22**

Paper 2

October/November 2025**2 hours**

You must answer on the question paper.

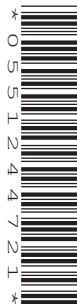
No additional materials are needed.

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. Any blank pages are indicated.

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

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

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

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 The line $y = 4x - 3$ meets the curve $y = 3 + 5x - 2x^2$ at the points A and B .

(a) Find the coordinates of A and B .

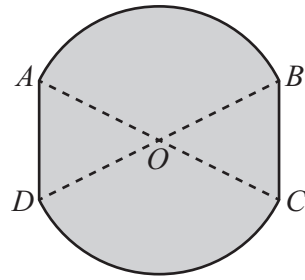
[4]

(b) The perpendicular bisector of the line AB cuts the coordinate axes at the points P and Q .

Given that O is the origin, find the area of the triangle POQ .

[5]





The diagram shows the shaded region $ABCD$.

The lines AC and BD each have a length of 12 cm.

The lines AC and BD bisect each other at the point O .

The lines AD and BC are parallel and each have a length of 4 cm.

The arcs AB and DC are part of a circle centre O .

- (a) Find the obtuse angle AOB .
Give your answer in radians.

[3]

Use your answer to **part (a)** to find

- (b) (i) the perimeter of the shaded region

[2]

- (ii) the area of the shaded region.

[3]



- 3 Find the exact value of the term independent of x in the expansion of $\left(2 + \frac{3}{x^2}\right)^{10} (1 - 4x^2)^2$.

[6]



- 4 Variables x and y are such that when e^y is plotted against x^3 , a straight-line graph is obtained. This line passes through the points $(1, 13.5)$ and $(7.5, 0.5)$.

(a) Find y in terms of x .

[4]

(b) Find the values of x for which your equation is valid.

[2]



- 5 A 6-character password is to be formed from the following characters.

Letters b f g k m

Numbers 3 5 7 9

Symbols * ! @

Each character can be used at most once in any 6-character password.

- (a) Find the number of 6-character passwords that can be formed if there are no further restrictions. [1]

- (b) Find the number of 6-character passwords that can be formed if the password starts and ends with a symbol. [2]

- (c) Find the number of 6-character passwords that can be formed if the password:
- starts with either a symbol and then a number, or a number and then a symbol and
 - ends with 2 letters.
- [2]



- 6 In this question lengths are in centimetres and time, t , is in seconds.

A particle P is moving in a straight line with a speed of 26 in the direction of the vector $\begin{pmatrix} 5 \\ -12 \end{pmatrix}$.

- (a) Find the velocity vector of P .

[2]

When $t = 0$, P passes through a point A which has position vector $\begin{pmatrix} 3 \\ 6 \end{pmatrix}$.

- (b) Write down the position vector of P at time t .

[2]

At the same time that P passes through A , a particle Q passes through a point B .

The position vector of Q at time t is given by $\begin{pmatrix} 8t-5 \\ 2-25t \end{pmatrix}$.

The distance between P and Q at time t is d .

- (c) Show that $d^2 = mt^2 + nt + r$, where m , n and r are integers to be found.

[3]

- (d) Hence show that P and Q do **not** collide.

[1]





7 (a) Given that $y = x \cos 2x$, find $\frac{dy}{dx}$.

[2]

(b) Hence find $\int x \sin 2x \, dx$.

[4]





- 8 An arithmetic progression has first term t and common difference 1.5.
The 4th, 8th and 20th terms of this arithmetic progression form the 1st, 2nd and 3rd terms of a geometric progression.

(a) Find the value of t .

[5]

(b) Find the common ratio of the geometric progression.

[2]



9 It is given that $f(x) = \ln(2x+5)$ for $x > a$, where a is a constant.

(a) Write down the least possible value of a .

[1]

(b) Using your value of a , write down the range of f .

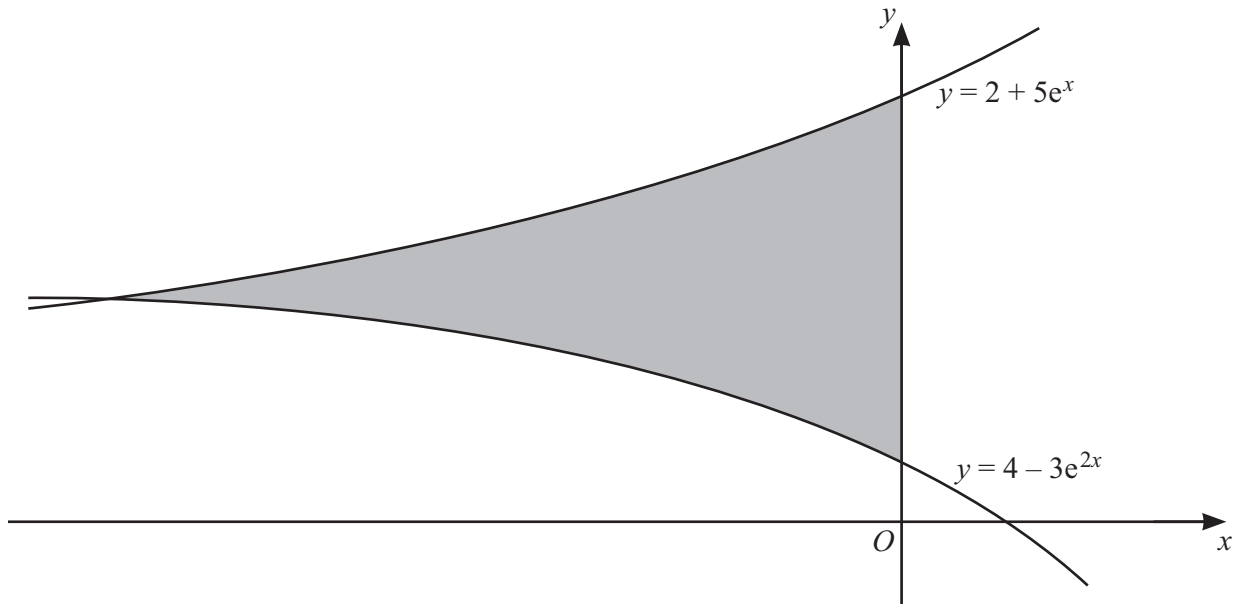
[1]

It is also given that $g(x) = x^2 + 1$ for $x \in \mathbb{R}$.

(c) Using your value of a , solve the equation $fg(x) = 4$.
Give your answers in exact form.

[3]





The diagram shows parts of the graphs of $y = 2 + 5e^x$ and $y = 4 - 3e^{2x}$.

Find the area of the shaded region.

Give your answer in the form $a + b \ln 3$, where a and b are exact constants.

[10]





Additional working space for Question 10.





11 (a) Solve the equation $\tan^2 2x - 4 \tan 2x = 0$ for $0^\circ \leq x \leq 180^\circ$.

[4]



(b) Solve the equation $\operatorname{cosec}(y + 1.2) = 4$, where y is in radians and $-5 < y < 2$.

[6]





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.

