Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

* 0 5 5 1 2 4 4 7 2 1 *

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.

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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

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

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

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

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

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

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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]

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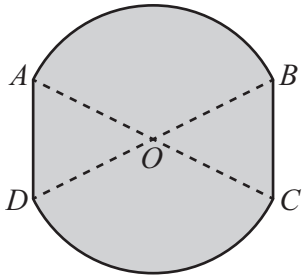

The diagram shows the shaded region *ABCD*.
The lines *AC* and *BD* each have a length of 12 cm.
The lines *AC* and *BD* bisect each other at the point *O*.
The lines *AD* and *BC* are parallel and each have a length of 4 cm.
The arcs *AB* and *DC* are part of a circle centre *O*.

(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]

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3 Find the exact value of the term independent of x in the expansion of $\left(2+\frac{3}{x^2}\right)^{10}\left(1-4x^2\right)^2$. [6]

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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]

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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]

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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]

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

(b) Hence find $\int x\sin 2x \, dx$. [4]

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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]

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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]

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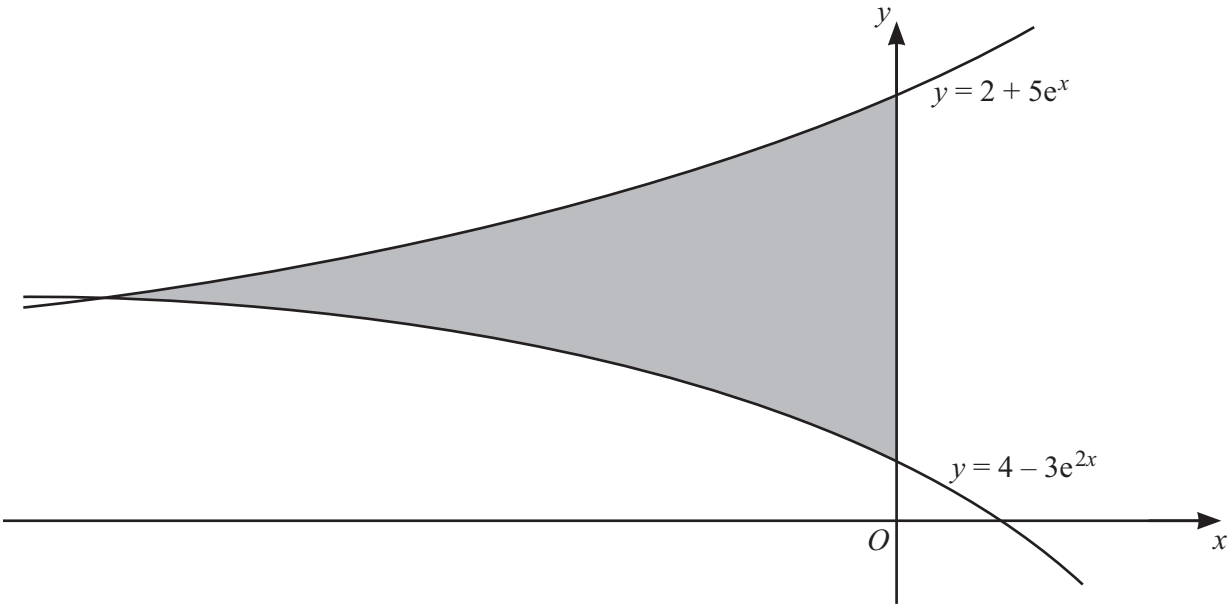

The diagram shows parts of the graphs of $y = 2 + 5e^x$ and $y = 4 - 3e^{2x}$.

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]

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Additional working space for Question 10.

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11 **(a)** Solve the equation $\tan^2 2x - 4\tan 2x = 0$ for $0° \leqslant x \leqslant 180°$. [4]

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(b) Solve the equation $\operatorname{cosec}(y + 1.2) = 4$, where y is in radians and $-5 < y < 2$. [6]

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