* 0000800000001 * DFD

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.

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

$$\frac{a}{\sin A}=\frac{b}{\sin B}=\frac{c}{\sin C}$$
$$a^2=b^2+c^2-2bc\cos A$$
$$\Delta=\frac{1}{2}ab\sin C$$

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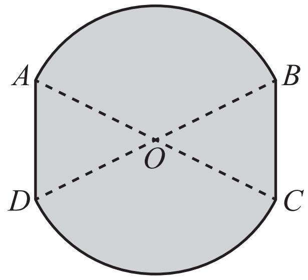
1 The line $y = 4x - 3$ meets the curve $y = 3 + 5x - 2x^2$ at the points A and B.

(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]

2



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 $\left(2+\frac{3}{x^2}\right)^{10}\left(1-4x^2\right)^2$. [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.

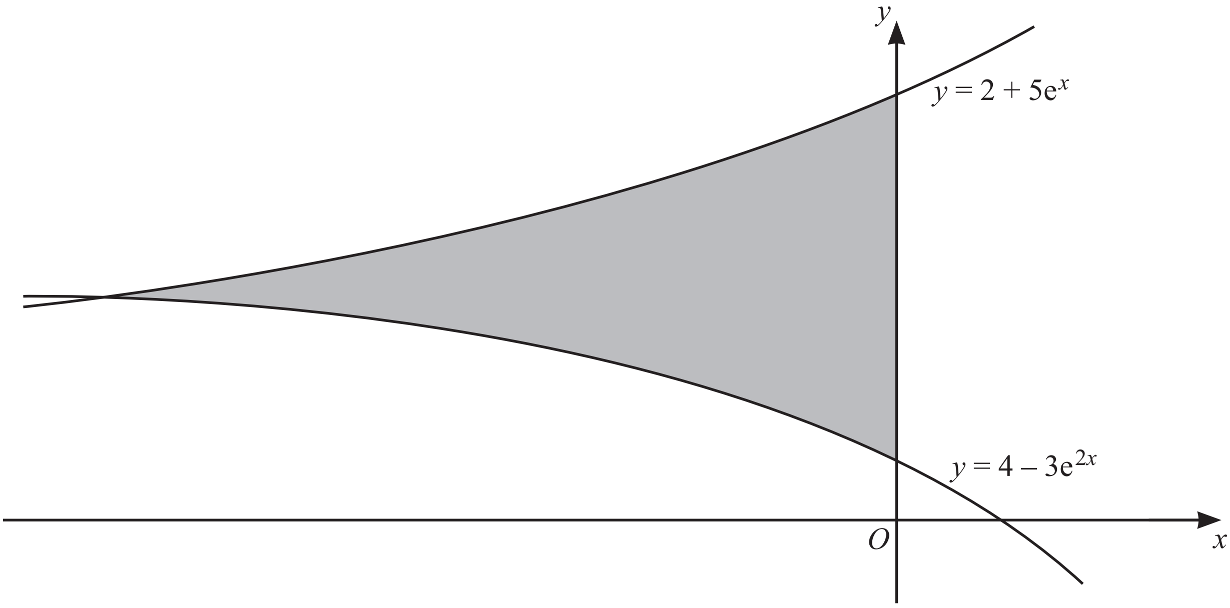
(a) Write down the least possible value of a. [1]

(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]

10



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 $0° \leqslant x \leqslant 180°$. [4]

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

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