



Cambridge O Level

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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 .

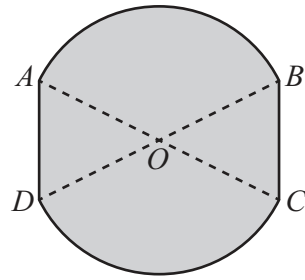
[4]

(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 .

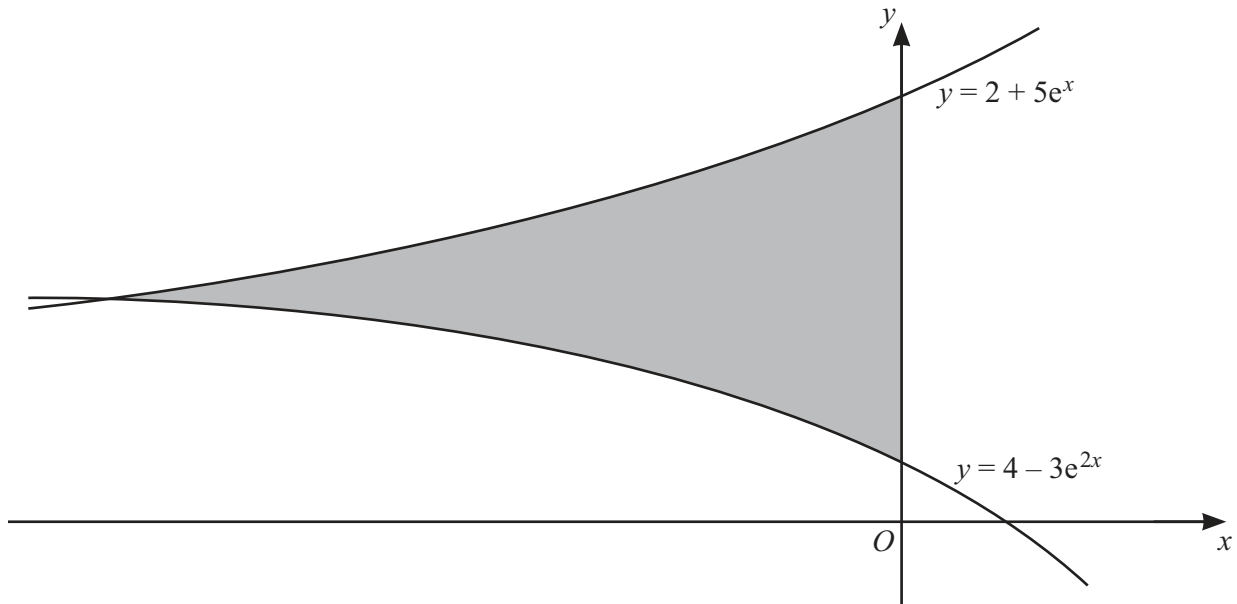
[1]

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]

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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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