CAMBRIDGE
International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0535863680

ADDITIONAL MATHEMATICS **4037/22**

Paper 2 **May/June 2026**

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. Do **not** use correction fluid or tape.
- 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.

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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. $A = \pi rl$

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 point A is the minimum point on the curve $y = x^2 - 6x + 10$.

(a) Using the method of completing the square, find the coordinates of A. [2]

(b) The point B has coordinates (6, 7).
The curve cuts the y-axis at the point C.

Find the equation of the line through B parallel to the line AC. [2]

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2 Show that there is no real value of k for which the equation

$$(k-2)x^2 + (2k+3)x + 3 = 0$$

has two equal roots. [3]

3 **(a)** Differentiate $y = \sqrt{x+1} + \cos(5x+3)$ with respect to x. [3]

(b) Find $\int \sec^2 \frac{x}{3} \mathrm{d}x$. [3]

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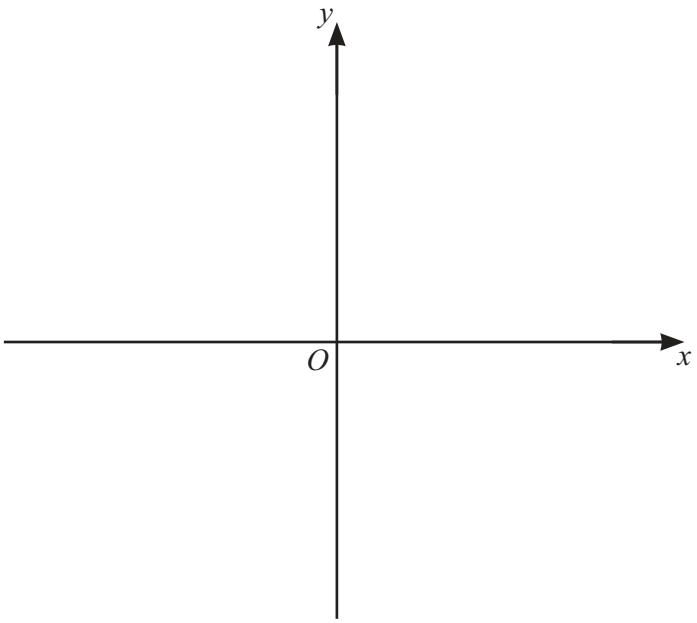
4 **(a)** On the axes, sketch the graph of $y = |x^2 - 5|$.
State the intercepts with the coordinate axes. [3]



(b) It is given that $f(x) = ax + b$ where a and b are non-zero integers.
The solutions of the equation $|f(x)| = 4$ are $x = 2.5$ and $x = -1.5$.

Find the possible expressions for $f(x)$. [4]

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5 **(a)** In this question, 6-digit numbers do not start with 0.

Find how many 6-digit numbers have 6 different digits and are divisible by 2. [3]

(b) A committee of 10 people is to be selected from 9 students and 7 teachers.

Find the number of different committees that can be selected if the committee must have at least 4 students and at least 4 teachers. [3]

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6 In this question, a, b and c are integers.

When the expansion of $(a+x)^4(1+ax)^5$ is written in ascending powers of x, the first three terms are $16+bx+cx^2$.

Find all the possible values of a, b and c. [8]

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7 In this question, **i** is a unit vector due east and **j** is a unit vector due north.
Distances are measured in kilometres and time is measured in hours.

Point P has position vector $2\mathbf{i} + 5\mathbf{j}$ relative to an origin O.
At 13 00, boat A sails from point P with velocity vector $8\mathbf{i} + 8\mathbf{j}$.

(a) Find the position vector of A at the end of 2 hours of sailing. [1]

(b) Write down the position vector of A at the end of t hours of sailing. [1]

(c) Point Q has position vector $20\mathbf{i} + 8\mathbf{j}$ relative to the origin O.
At 15 00, boat B sails from point Q on a bearing of 300° with a constant speed of $5\sqrt{3}$.

Find the position vector of B at 17 00. [3]

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(d) Find the distance between the two boats at 1700. [3]

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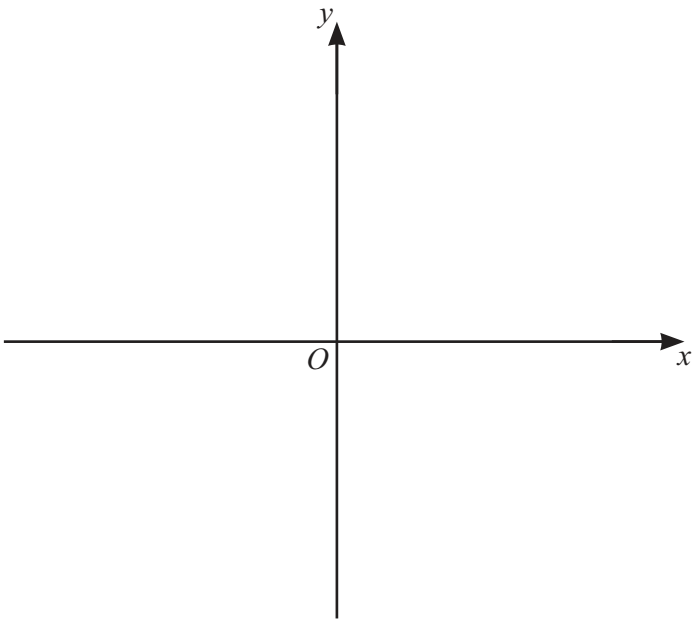
8 The function f is defined, for $x \geqslant -1$, by $\mathrm{f}(x) = 1 + 2^x$.

(a) Find the range of f. [1]

(b) **(i)** Write down the domain of f^{-1}. [1]

(ii) Find an expression for $\mathrm{f}^{-1}(x)$. [2]

(iii) On the axes, sketch the graph of $y = \mathrm{f}(x)$ and hence the graph of $y = \mathrm{f}^{-1}(x)$. State any intercepts with the coordinate axes. [4]



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(c) The function g is defined, for $x \geqslant -1$, by $g(x) = x(x+k)$ where k is a constant.

(i) Explain why gf exists. [1]

(ii) Find an expression for $gf(x)$. [1]

(iii) It is given that $gf(3) = 126$.

Find the value of k. [2]

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9 A particle P moves in a straight line such that t seconds after passing through a fixed point O, its displacement from O, s metres, is given by $s = e^{4t} - 10e^{2t} + 9$.

(a) The velocity of P is $v\,\text{ms}^{-1}$.

Find the value of t for which v has a stationary value. [5]

(b) Find the acceleration of P when $t = \ln 2$. [2]

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10 Solve the equation $\tan(3x+1) = 5\sin(3x+1)$ for $-\frac{\pi}{3} < x < \frac{\pi}{3}$. [6]

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11 Solutions to this question by accurate drawing will not be accepted.

A circle C_1 has centre (3, 5).
The point $P(1, 4)$ lies on circle C_1.

A circle C_2 has centre (12, 8).
The line with equation $y = 19 - 3x$ is the common chord of circles C_1 and C_2.

Find the radius of circle C_2. [9]

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Continuation of working space for Question 11.

Question 12 is on the back page.

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12 A sphere has volume $V\,\text{cm}^3$ and radius r cm.

Given that r varies with time t, find V at the instant when $\dfrac{\mathrm{d}V}{\mathrm{d}t} = 9\dfrac{\mathrm{d}r}{\mathrm{d}t}$. [4]

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