



Cambridge O Level

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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.

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

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

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 $\triangle ABC$

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

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

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



1 The 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]

- 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]

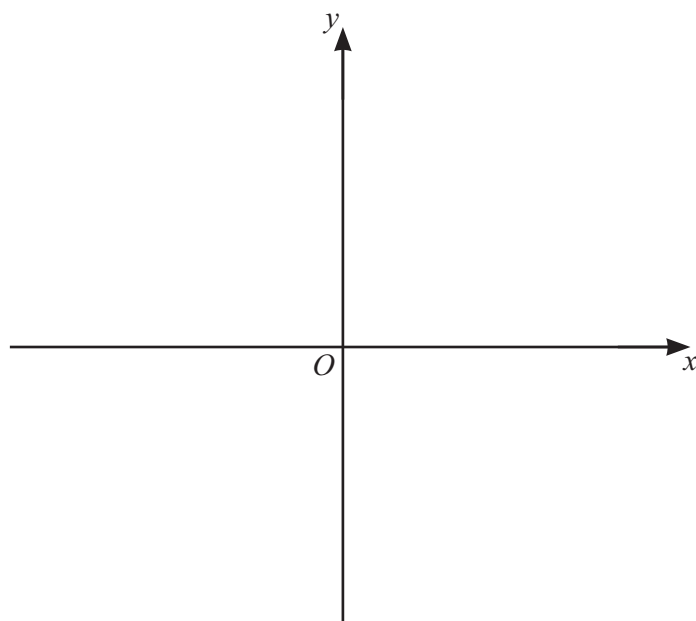
- (b) Find $\int \sec^2 \frac{x}{3} dx$.

[3]



- 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]

- 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]





- 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]

- 7 In this question, $\mathbf{i}$ is a unit vector due east and $\mathbf{j}$ 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]



(d) Find the distance between the two boats at 17 00.

[3]



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

(a) Find the range of f .

[1]

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

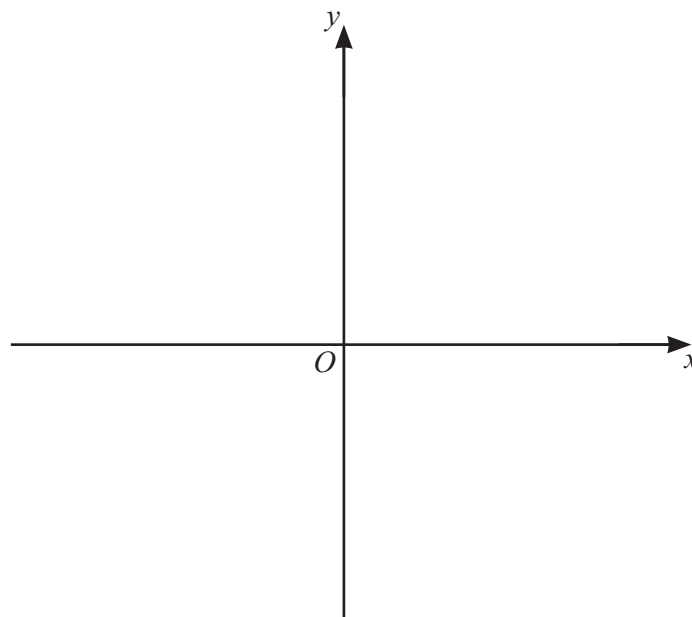
[1]

(ii) Find an expression for $f^{-1}(x)$.

[2]

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

[4]



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

(i) Explain why g exists.

[1]

(ii) Find an expression for $g'(x)$.

[1]

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

Find the value of k .

[2]



- 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]



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

[6]



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]





Continuation of working space for Question 11.

Question 12 is on the back page.





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

Given that r varies with time t , find V at the instant when $\frac{dV}{dt} = 9\frac{dr}{dt}$. [4]

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