CAMBRIDGE
International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

ADDITIONAL MATHEMATICS **4037/12**

Paper 1 Non-calculator **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.
- Calculators must **not** be used in this paper.
- You must show all necessary working clearly.

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. $A = \pi r l$

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

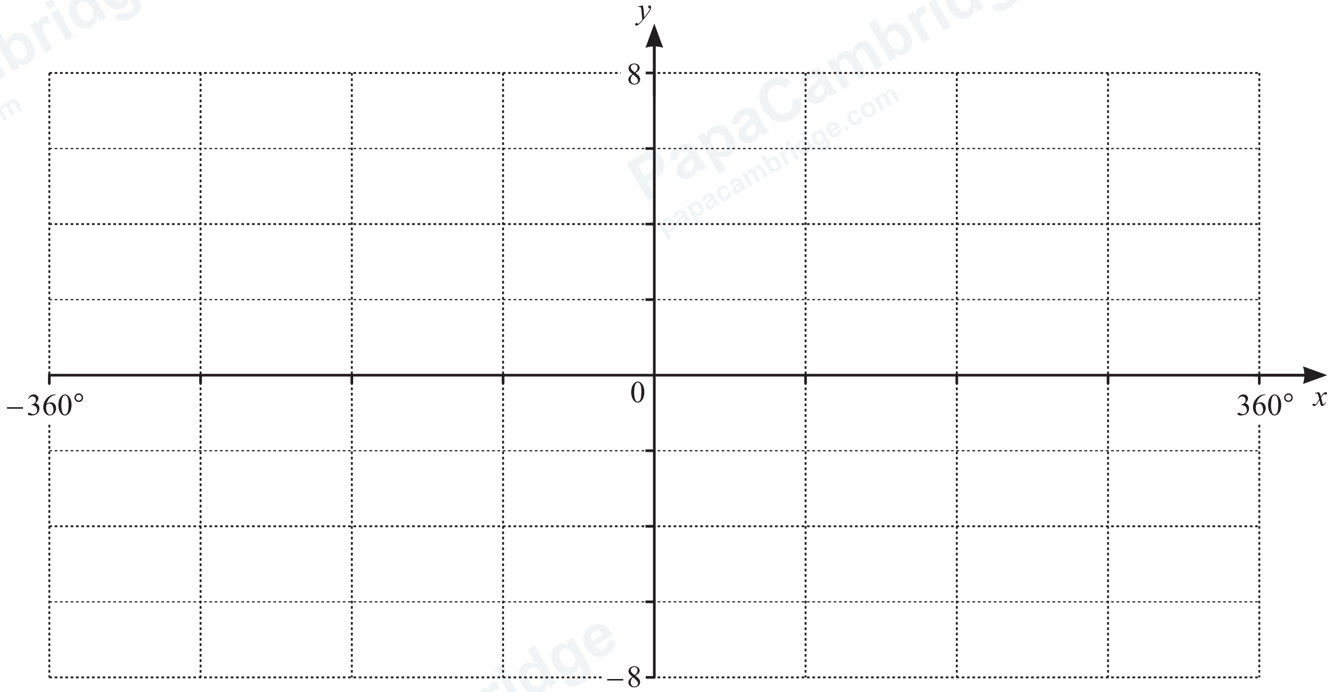
$$\sin^2 A + \cos^2 A = 1$$
$$\sec^2 A = 1 + \tan^2 A$$
$$\operatorname{cosec}^2 A = 1 + \cot^2 A$$

Formulas for ΔABC

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

Calculators must **not** be used in this paper.

1 **(a)** On the axes, sketch the graph of $y = 4\cos x - 2$ for $-360° \leqslant x \leqslant 360°$. [2]



(b) Write down the amplitude of $4\cos x - 2$. [1]

(c) Write down the period of $4\cos x - 2$. [1]

(d) Write down the set of values of the constant k for which the equation $4\cos x - 2 = k$ has at least two solutions. [1]

2 Points A and B have coordinates $A(-2, 3)$ and $B(8, -3)$.

(a) The perpendicular bisector of AB passes through the point $C(0, c)$.

Find the value of c. [3]

(b) The point D has coordinates $(2, -1)$.

The lengths of AD and BD are such that $BD = \frac{\sqrt{n}}{2}AD$ where n is an integer.

Find the value of n. [4]

3 The polynomial p is given by $\mathrm{p}(x) = 6x^3 - x^2 - 5x + 2$.

(a) Find the remainder when $\mathrm{p}(x)$ is divided by $x + 2$. [1]

(b) Write $\mathrm{p}(x)$ as a product of linear factors. [4]

(c) Hence solve the equation $6u^6 - u^4 - 5u^2 + 2 = 0$. [2]

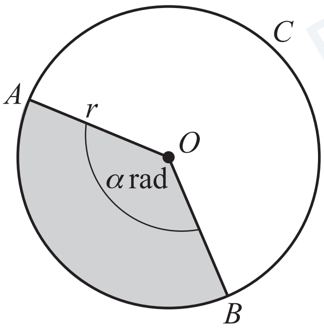
4 An arithmetic progression has first term $u_1 = 400$ and common difference $d = -2$.

(a) Find the 81st term and the 100th term. [2]

(b) Find the sum of all the terms from the 81st to the 100th, $u_{81} + u_{82} + \ldots + u_{100}$. [3]

5 Find, in exact form, the equation of the tangent to the curve $y = \ln\left((2x-4)^5\right)$ at the point where $x = 3$. [4]

6 In this question lengths are in centimetres.



The diagram shows a circle with centre O and radius r.
Points A, B and C are on the circumference of the circle.
Angle $AOB = \alpha$ radians.

(a) The perimeter of the shaded sector is equal to the length of the major arc, ACB.

Find the exact value of α. [4]

(b) The area of the shaded sector is $18(\pi^2 - 1)$.

Find the exact value of r.
Simplify your answer. [4]

7 Show that $\operatorname{cosec} x - \sin x$ can be written as $\dfrac{\cos x}{\tan x}$. [3]

8 Variables x and y are related by the equation $y = \dfrac{5x+1}{x-2}$.

Using calculus, find the approximate change in x when y increases from 4 by the small amount h. [5]

9 **(a)** Write $\dfrac{1}{\log_x e} - \ln(x-1)$ as a single logarithm to base e. [2]

(b) Solve the equation $2\log_5 2x = 1 + \log_5(9x-10)$. [5]

10 It is given that a geometric progression has the following terms.

2nd term	$11x - 1$
3rd term	$x + 5$
4th term	$x - 1$

(a) Given that $x > 0$, find the common ratio and first term of the progression. [6]

(b) The sum to infinity of this progression is $\frac{k}{3}$ where k is an integer.

Find the value of k. [2]

11 The position vectors of points A and B relative to an origin O are

$$\overrightarrow{OA} = \begin{pmatrix} 4 \\ -2 \end{pmatrix} \text{ and } \overrightarrow{OB} = \begin{pmatrix} -4 \\ 6 \end{pmatrix}.$$

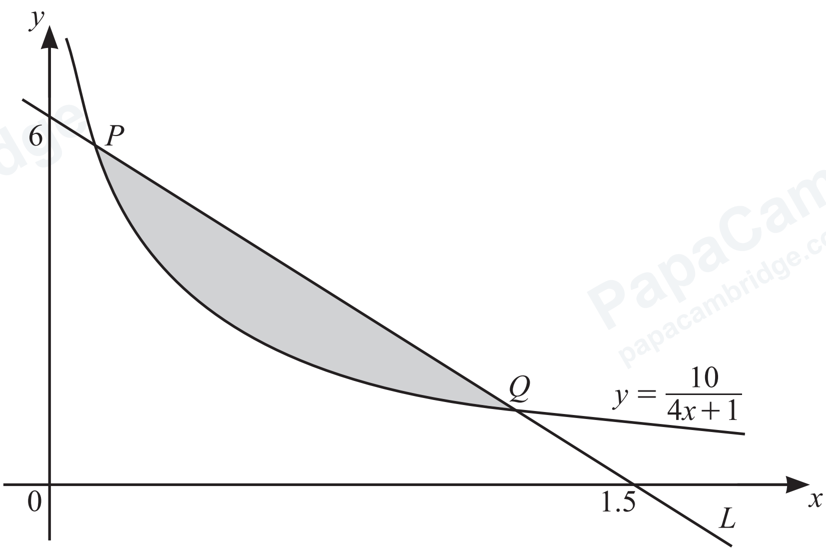
The point C lies on AB and is such that $AC : CB = 3 : 1$.

The point D lies on OA such that $\overrightarrow{OD} = \lambda\overrightarrow{OA}$ and $\overrightarrow{CD} = \begin{pmatrix} 5 \\ -5.5 \end{pmatrix}$.

(a) Find $\overrightarrow{OD}$. [5]

(b) Hence find the value of λ. [1]

12



The diagram shows part of the curve $y = \dfrac{10}{4x+1}$ and the line L.

L passes through the points (0, 6) and (1.5, 0).
The curve and L intersect at the points P and Q.

Find the exact area of the shaded region. [11]

Continuation of working space for Question 12.

Question 13 is on the back page.

13 Show that, for all values of $n \geqslant 3$, ${}^{n+2}\mathrm{C}_3 - {}^{n}\mathrm{C}_3 = n^2$. [4]