



Cambridge O Level

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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.

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 $(a + b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \dots + \binom{n}{r}a^{n-r}b^r + \dots + b^n$,
 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 $u_n = ar^{n-1}$
 $S_n = \frac{a(1 - r^n)}{1 - r} \quad (r \neq 1)$
 $S_\infty = \frac{a}{1 - r} \quad (|r| < 1)$

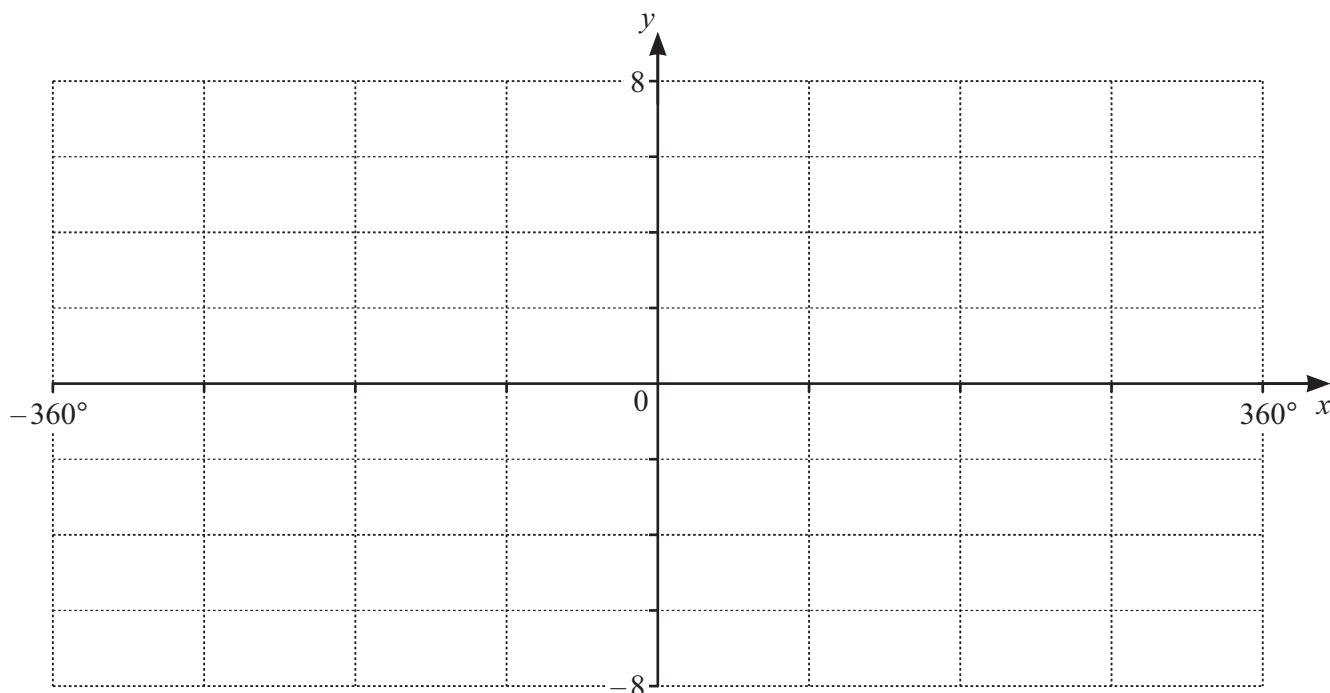
Identities $\sin^2 A + \cos^2 A = 1$
 $\sec^2 A = 1 + \tan^2 A$
 $\operatorname{cosec}^2 A = 1 + \cot^2 A$

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



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

- 1 (a) On the axes, sketch the graph of $y = 4 \cos x - 2$ for $-360^\circ \leq x \leq 360^\circ$. [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 $p(x) = 6x^3 - x^2 - 5x + 2$.

(a) Find the remainder when $p(x)$ is divided by $x + 2$.

[1]

(b) Write $p(x)$ 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, $u_{81} + u_{82} + \dots + u_{100}$.

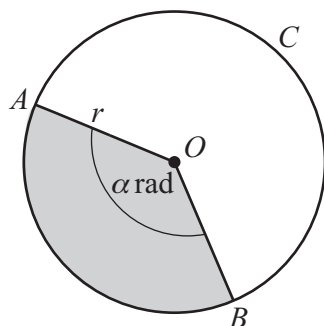
[3]



- 5 Find, in exact form, the equation of the tangent to the curve $y = \ln((2x-4)^5)$ 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 $\frac{\cos x}{\tan x}$.

[3]



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

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

[5]



- 9 (a) Write $\frac{1}{\log_x e} - \ln(x-1)$ 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 $\overrightarrow{OD}$.

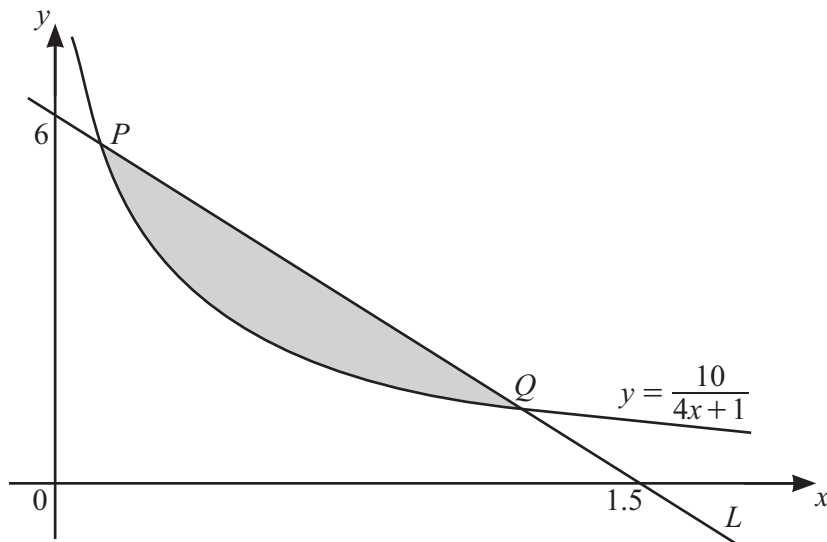
[5]

- (b) Hence find the value of λ .

[1]



12



The diagram shows part of the curve $y = \frac{10}{4x+1}$ 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 $n \geq 3$, ${}^{n+2}C_3 - {}^nC_3 = n^2$.

[4]

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