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CAMBRIDGE International Education

Cambridge O Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

0352114880

ADDITIONAL MATHEMATICS **4037/11**

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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[Turn over

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

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

1 Solve the equation $|5x+4| = |3x-2|$. [3]

2 A circle has equation $(x-3)^2+(y-4)^2=20$.

(a) Write down the coordinates of the centre of the circle. [1]

(b) Write down the radius of the circle. [1]

(c) The line AB is a diameter of this circle.
The point A has coordinates $(-1, 6)$.

Find the coordinates of the point B. [2]

3 Show that $(3+5\cot\theta)^2+(3-5\cot\theta)^2-50\operatorname{cosec}^2\theta$, where $0<\theta<\frac{\pi}{2}$, can be simplified to a constant. [4]

4 Given that $\int_0^a \frac{1}{3x+2}\,dx = \ln 4$, find the value of the constant a. [5]

5 The polynomial p is such that $p(x) = ax^3 + 4x^2 - ax - 28$, where a is a positive constant.

It is given that $p(a) = 0$.

(a) Find the value of a. [4]

(b) Using your value of a, find $p(x)$ as a product of a linear factor and a quadratic factor. [2]

(c) Hence show that the equation $p(x) = 0$ has exactly one root. [2]

6 The function f is such that $\mathrm{f}(x) = 3x^2 + 8x$ for $x \geqslant k$, where k is a constant.
It is given that f^{-1} exists.
k has the least possible value for which f^{-1} exists.

(a) Find the value of k. [2]

(b) Find the range of f. [2]

(c) Find an expression for f^{-1}. [3]

(d) The function g is such that $g(x) = 3^x$ for $x > -6$.

(i) Write down the domain of gf. [1]

(ii) Solve the equation $gf(x) = 27$. [4]

7 A curve has equation $y = \dfrac{4+e^{2x}}{2+e^{x}}$.

(a) Show that, when $\dfrac{dy}{dx} = 0$, $e^{2x} + 4e^{x} - 4 = 0$. [5]

(b) Hence find the x-coordinate of the stationary point on the curve.
Give your answer in the form $\ln\left(a\sqrt{b}+c\right)$, where a, b and c are integers. [4]

8 **(a)** Write down the value of $\lg(10000)$. [1]

(b) Solve the equation $\log_2(\log_3 x) = 2$. [3]

(c) Solve the equation $\log_x 5 = \log_5 x^4$. [4]

9 **(a)** A geometric progression has common ratio r and first term a, where $a \neq 0$.
The 4th term is -8 times the 7th term.

(i) Find the value of r. [2]

(ii) The sum of the first 5 terms of this progression is $\dfrac{99}{32}$.

Find the value of a. [2]

(b) The first three terms of a different geometric progression are $\cos\theta\sin\theta$, $\cos\theta\sin^3\theta$ and $\cos\theta\sin^5\theta$, for $0 < \theta < \dfrac{\pi}{2}$.

Show that the sum to infinity of this progression is $\tan\theta$. [4]

10 A curve has equation $y = \mathrm{f}(x)$, where $\mathrm{f}''(x) = (2x+10)^{-\frac{1}{2}} - 2x$.

The curve has a stationary point at $\left(3, \dfrac{64}{3}\right)$.

Find the equation of the curve. [8]

11 A triangle OAB is such that $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

The point X lies on OA such that $\overrightarrow{OA} = 3\overrightarrow{OX}$.

The point Y lies on XB such that $\overrightarrow{XB} = 5\overrightarrow{XY}$.

The point Z lies on OB such that $\overrightarrow{OB} = m\overrightarrow{OZ}$, where m is a scalar.

$\overrightarrow{OX} = n\overrightarrow{ZY}$, where n is a scalar.

Use a vector method to find the values of m and n. [8]

Question 12 is on the back page.

12 Find the value of n such that ${}^{n+3}C_6 = 12 \times {}^{n+2}C_5$. [3]