* 0000800000001 *

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 5 2 5 1 5 3 8 6 9 1 *

ADDITIONAL MATHEMATICS **0606/22**

Paper 2 **May/June 2025**

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 or correction fluid.
- 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. $A=\pi rl$

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

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

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 inequality $|5x+2| \geqslant 3$. [4]

2 In this question, all lengths are in metres and time is in seconds.

A particle P moves in a straight line such that its displacement s from a fixed point O at time t is given by $s=(t-4)^2(t-1)$ for $t \geqslant 0$.

(a) On the axes, sketch the displacement–time graph of P, stating the intercepts with the axes. [2]

(b) Find an expression for the velocity, v, of P.
Give your answer in a factorised form. [2]

(c) On the axes, sketch the velocity–time graph of *P*, stating the intercepts with the axes. [2]

(d) Find an expression for the acceleration, *a*, of *P*. [1]

(e) On the axes, sketch the acceleration–time graph of *P*, stating the intercepts with the axes. [3]

3 Functions f and g are such that

$$f(x) = \frac{3x}{x+4} \quad \text{for } x > 0$$

$$g(x) = \sqrt{x+2} \quad \text{for } x > -2 .$$

Solve the equation $fg(x) = 1$. [4]

4 **(a)** Given that $y = 4\sin 2x \cos 2x$, find the value of $\frac{dy}{dx}$ when $x = \frac{\pi}{6}$. [4]

(b) A curve has equation $y = 4\sin 2x \cos 2x$.

The normal to the curve at the point where $x = \frac{\pi}{6}$ meets the x-axis at the point P.

Find the exact coordinates of P. [5]

5 **(a)** A 4-digit number is to be formed using the digits 0, 2, 4, 5, 6 and 8.
The 4-digit number must **not** start with 0.
Any digit may be used at most once in the 4-digit number.

(i) Find how many 4-digit numbers can be formed. [1]

(ii) Find how many even 4-digit numbers can be formed. [2]

(iii) Find how many 4-digit numbers that are divisible by 5 can be formed. [2]

(b) Solve the equation $(n+1) \times {}^{n+1}C_{12} = 33(n-10) \times {}^{n}C_{10}$. [3]

6 The volume, V, of a sphere is increasing at the constant rate of $2\pi\,\text{cm}^3\,\text{s}^{-1}$.
Find the rate of change of the surface area, S, of this sphere when the volume of the sphere is $36\pi\,\text{cm}^3$. [6]

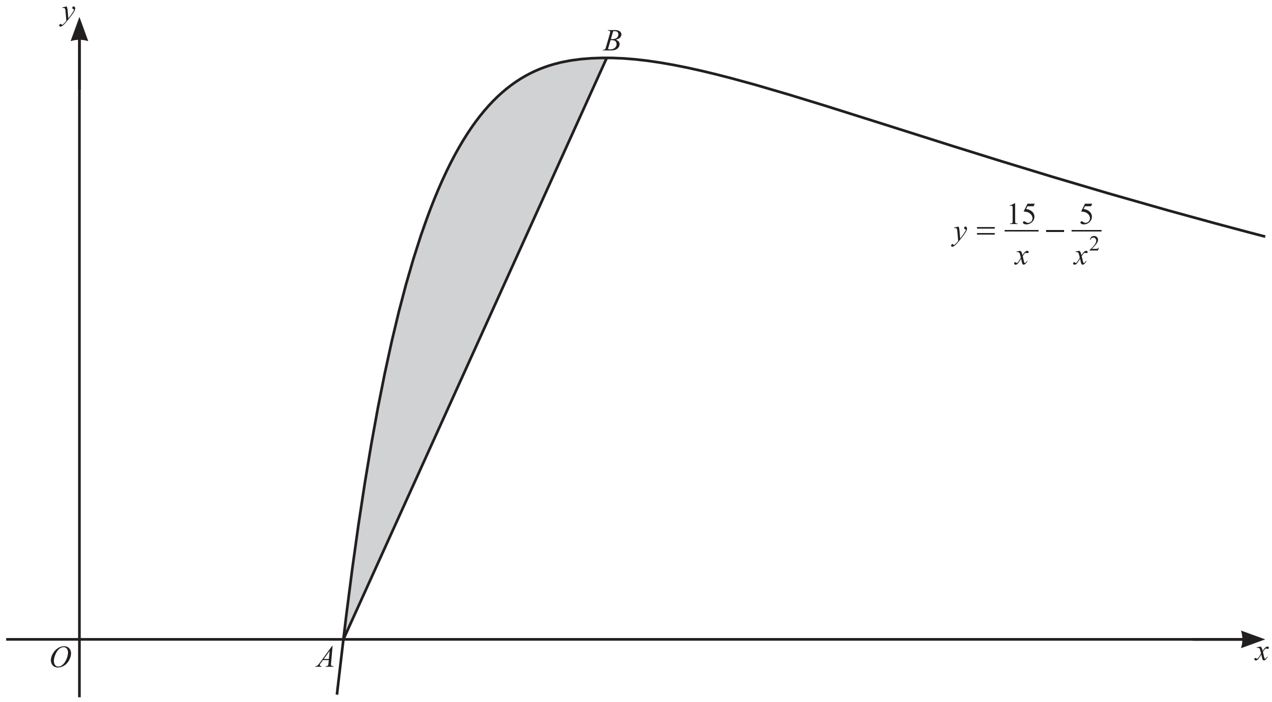
7 The first three terms of an arithmetic progression can be written as

$$2\ln\left(x^3\right),\quad 5\ln\left(x^2\right),\quad 2\ln\left(x^7\right).$$

(a) Given that $x > 1$, find the least number of terms for the sum of this progression to be greater than $43\ln\left(x^{24}\right)$. [6]

(b) Given that the 25th term of this progression is equal to 408, find the exact value of x. [3]

8



The diagram shows part of the curve $y = \frac{15}{x} - \frac{5}{x^2}$.

The curve meets the x-axis at the point A.
The curve has a maximum at the point B.

Find the area of the shaded region enclosed by the line AB and the curve.

Give your answer in exact form. [11]

Continuation of working space for Question 8.

9 **(a)** Solve the equation $3\sec 3x = \sqrt{3}\operatorname{cosec} 3x$ for $-120° \leqslant x \leqslant 120°$. [5]

(b) Solve the equation $2\cos\left(y+\frac{\pi}{3}\right)\sin\left(y+\frac{\pi}{3}\right)=\sin\left(y+\frac{\pi}{3}\right)$ for $0 \leqslant y < 2\pi$. [5]

Question 10 is printed on the next page.

10 The first three terms, in descending powers of x, in the expansion of $\left(3x^2 - a\right)^n\left(1 + \frac{1}{x^2}\right)^2$ can be written as $729x^{12} + 972x^{10} + bx^8$, where a, b and n are constants.

Find the values of a, b and n. [9]