



# Cambridge IGCSE™

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**ADDITIONAL MATHEMATICS**

**0606/01**

Paper 1 Non-calculator

**For examination from 2025**

SPECIMEN PAPER

**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.
- 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  $u_n = a + (n - 1)d$   
 $S_n = \frac{1}{2}n(a + l) = \frac{1}{2}n\{2a + (n - 1)d\}$

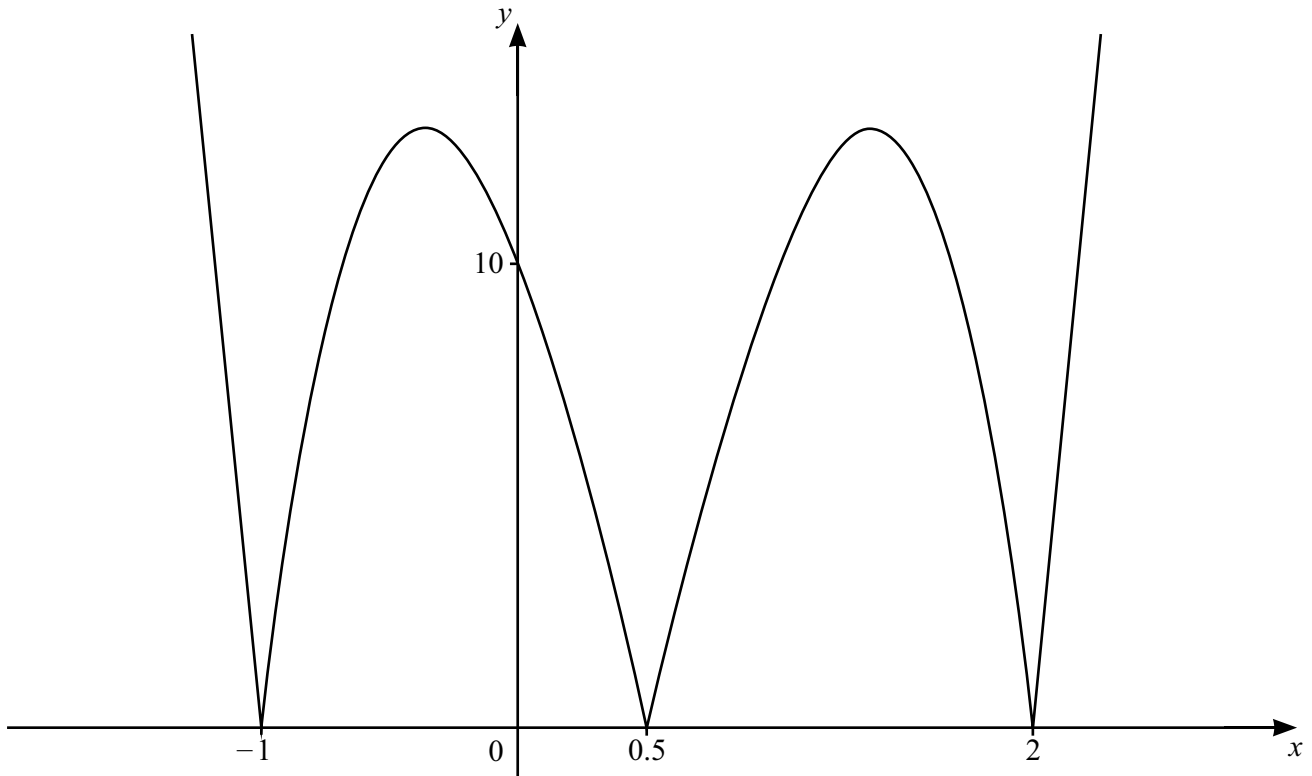
Geometric series  $u_n = ar^{n-1}$   
 $S_n = \frac{a(1 - r^n)}{1 - r} \quad (r \neq 1)$   
 $S_\infty = \frac{a}{1 - r} \quad (|r| < 1)$

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



The diagram shows the graph of  $y = |f(x)|$ , where  $f(x)$  is a cubic function.

Find the possible expressions for  $f(x)$  in factorised form.

[3]

2 The polynomial  $p(x) = 6x^3 + ax^2 + bx + 2$ , where  $a$  and  $b$  are integers, has a factor of  $x - 2$ .

(a) Given that  $p(1) = -2p(0)$ , find the values of  $a$  and  $b$ . [4]

(b) Using your values of  $a$  and  $b$ ,

(i) find the remainder when  $p(x)$  is divided by  $2x - 1$  [2]

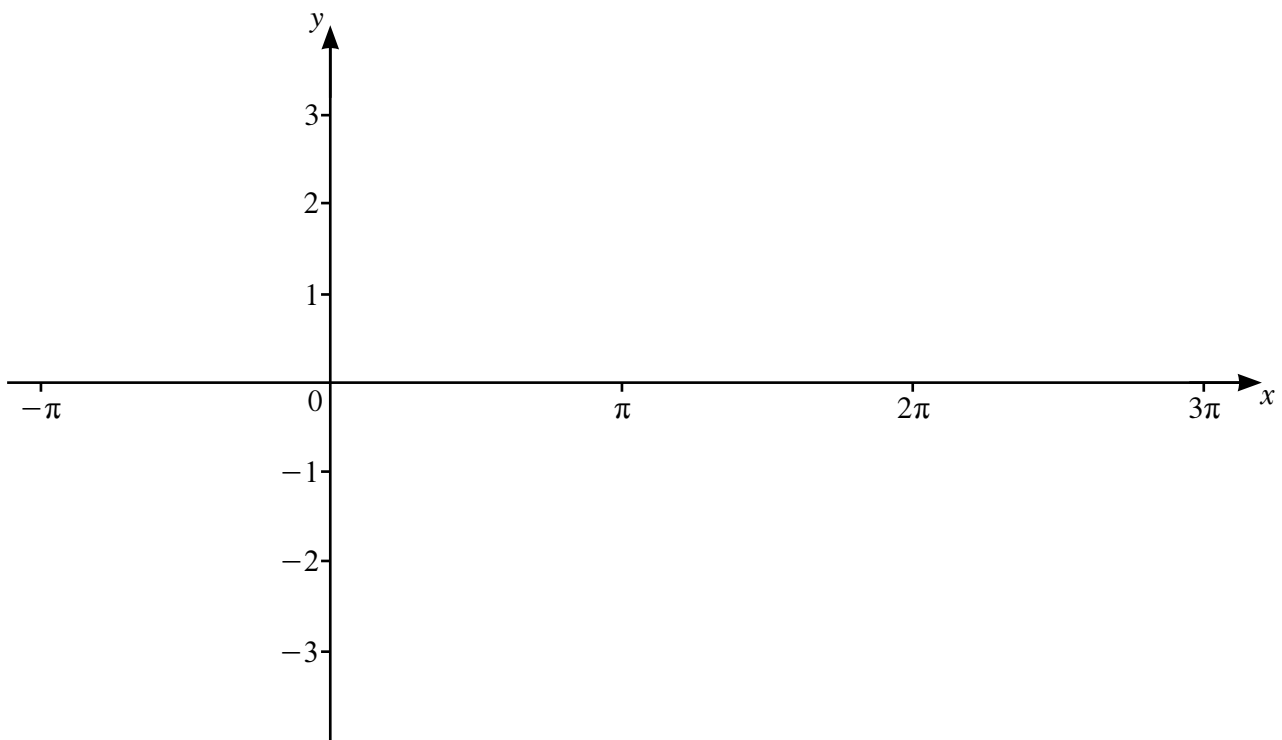
(ii) factorise  $p(x)$ . [2]

3 In this question, all angles are in radians.

(a) Write down the amplitude of  $2 \cos \frac{x}{3} - 1$ . [1]

(b) Write down the period of  $2 \cos \frac{x}{3} - 1$ . [1]

(c) On the axes below, sketch the graph of  $y = 2 \cos \frac{x}{3} - 1$  for  $-\pi \leq x \leq 3\pi$ . [3]



- 4 The parallelogram  $OABC$  is such that  $\overrightarrow{OA} = \mathbf{a}$  and  $\overrightarrow{OC} = \mathbf{c}$ . The point  $D$  lies on  $OC$  such that  $OD:DC = 1:2$ . The point  $E$  lies on  $AC$  such that  $AE:EC = 2:1$ .

Show that  $\overrightarrow{OB} = k\overrightarrow{DE}$ , where  $k$  is an integer to be found.

[5]

5 (a) Given that  $\log_a p + \log_a 5 - \log_a 4 = \log_a 20$ , find the value of  $p$ . [2]

(b) Solve the equation  $3^{2x+1} + 8(3^x) - 3 = 0$ . [3]

(c) Solve the equation  $4 \log_y 2 + \log_2 y = 4$ . [3]

6 (a)  $f(x) = 3e^{2x} + 1$  for  $x \in \mathbb{R}$

$g(x) = x + 1$  for  $x \in \mathbb{R}$

(i) Write down the range of  $f$  and the range of  $g$ . [2]

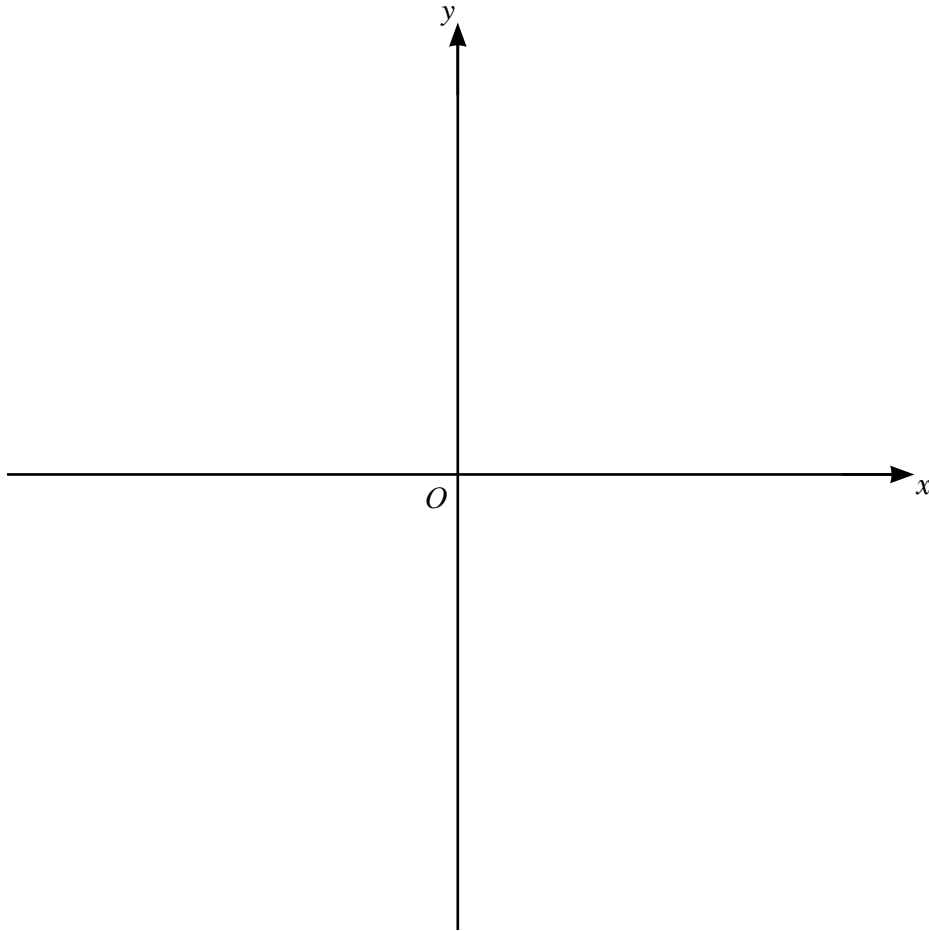
(ii) Find  $g^2(0)$ . [1]

(iii) Hence find  $fg^2(0)$ . [2]



(iv) On the axes below, sketch the graphs of  $y = f(x)$  and  $y = f^{-1}(x)$ .

State the intercepts with the coordinate axes and the equations of any asymptotes. [4]



(b) It is given that  $h(x) = a + \frac{b}{x^2}$ , where  $a$  and  $b$  are constants.

(i) Explain why  $-2 \leq x \leq 2$  is not a suitable domain for  $h(x)$ . [1]

(ii) Given that  $h(1) = 4$  and  $h'(1) = 16$ , find the values of  $a$  and  $b$ . [2]

- 7 (a) In an arithmetic progression, the 5th term is equal to  $\frac{1}{3}$  of the 16th term. The sum of the 5th term and the 16th term is equal to 33.

Find the sum of the first 10 terms of this progression.

[6]

- (b) In a geometric progression, the sum of the first two terms is equal to 16. The sum to infinity is equal to 25.

Find the possible values of the first term.

[6]

8 (a) Given that  $\int_1^a \left( \frac{2}{2x+3} + \frac{3}{3x-1} - \frac{1}{x} \right) dx = \ln 2.4$ , where  $a > 1$ , find the value of  $a$ . [7]

(b) (i) Find  $\frac{d}{dx}(6 \sin^3 kx)$ , where  $k$  is a constant. [2]

(ii) Hence find  $\int (\sin^2 2x \cos 2x) dx$ . [2]

9 In this question, the units are metres and seconds.

A particle  $P$  is travelling in a straight line. Its acceleration,  $a$ , away from a fixed point  $O$ , at time  $t$ , is given by  $a = (3t + 2)^{-\frac{1}{3}}$ , where  $t \geq 0$ .

When  $t = 2$ ,  $P$  is travelling with a velocity of 8 and has a displacement of  $-4.8$  from  $O$ .

(a) Find an expression for the velocity of  $P$  at time  $t$ . [3]

(b) Explain why  $P$  is never at rest. [1]

- (c) Find the displacement of  $P$  from  $O$  when  $t = \frac{25}{3}$ . [4]

**Question 10 is printed on the next page.**

10 A circle has a centre  $(2, -4)$  and radius 3.

The line  $y = 2x - 3$  intersects the circle at points  $A$  and  $B$ .

The perpendicular bisector of line  $AB$  intersects the circle at points  $X$  and  $Y$ .

Find the area of kite  $AXBY$ .

[8]

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