



# Cambridge IGCSE™

CANDIDATE  
NAME

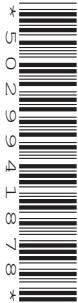


CENTRE  
NUMBER

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## ADDITIONAL MATHEMATICS

0606/11

Paper 1

October/November 2024

2 hours

You must answer on the question paper.

No additional materials are needed.

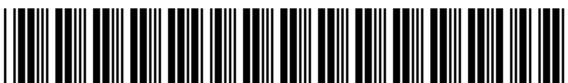
### INSTRUCTIONS

- 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 calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- 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.

### 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. Any blank pages are indicated.



## **Mathematical Formulae**



### **1. ALGEBRA**

#### *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*       $u_n = ar^{n-1}$

$$S_n = \frac{a(1-r^n)}{1-r} \quad (r \neq 1)$$

$$S_\infty = \frac{a}{1-r} \quad (|r| < 1)$$

### **2. TRIGONOMETRY**

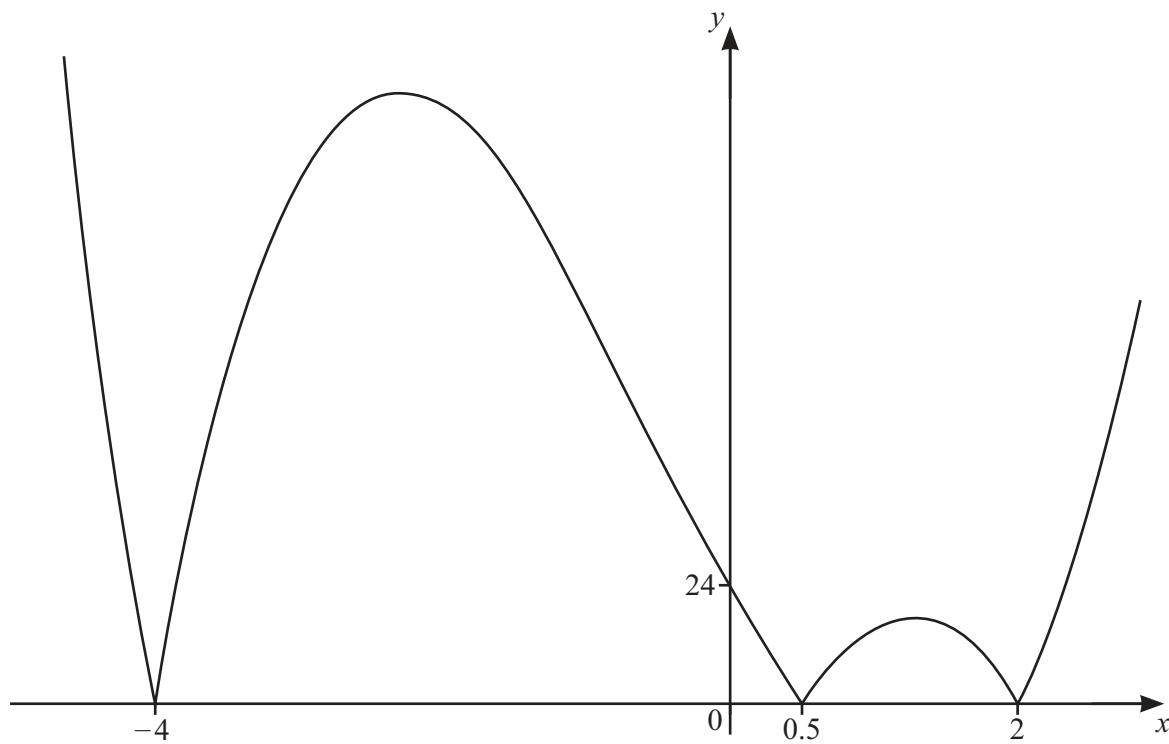
#### *Identities*

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

#### *Formulae for $\Delta ABC$*

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





The diagram shows the graph of  $y = |f(x)|$ , where  $f(x)$  is a cubic polynomial. Find the two possible expressions for  $f(x)$  in terms of linear factors with integer coefficients. [3]





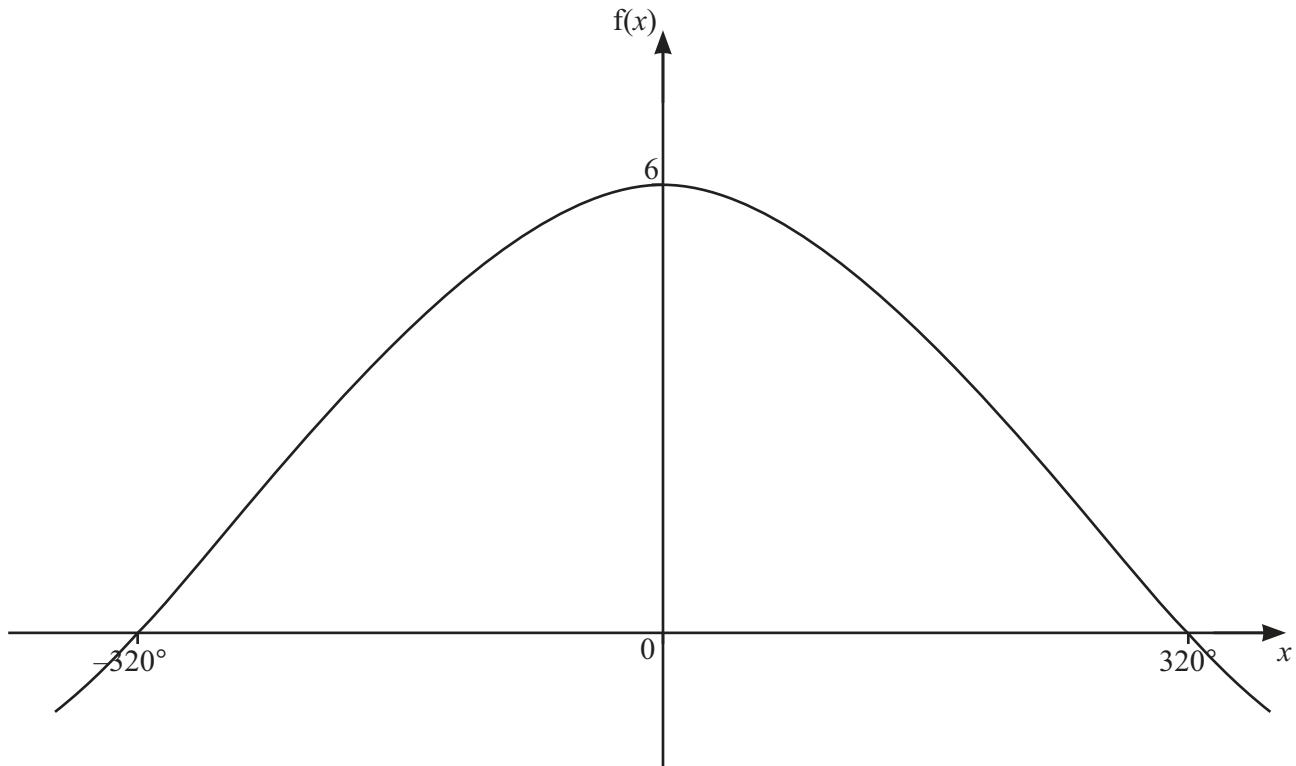
2 (a) Given that  $256^{x+y} \times 16^{-2x} = 8^{-x+3y}$ , show that  $y = 3x$ .

(b) Hence find the exact solutions of the following simultaneous equations.

$$256^{x+y} \times 16^{-2x} = 8^{-x+3y}$$

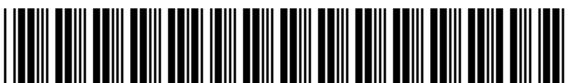
$$x^2 + 3y^2 = 56$$





The diagram shows part of the graph of  $f(x) = a \cos bx + c$ , where  $a$ ,  $b$  and  $c$  are constants. Given that  $f(x)$  has a period of  $960^\circ$ , find the values of  $a$ ,  $b$  and  $c$ . [4]





4 Given that  $\int_0^{2a+1} \frac{8}{4x+3} dx = \ln 16$ , find the exact value of the constant  $a$ .

5 (a) In the expansion of  $(1+kx)^{15}$ , where  $k$  is a constant, the coefficient of  $x^3$  is  $-29120$ . Find the value of  $k$ . [2]

(b) Find the term independent of  $y$  in the expansion of  $\left(8y^2 - \frac{1}{2y}\right)^{12}$ . [2]





6 The polynomial  $p$  is such that  $p(x) = ax^3 + 11x^2 + bx + c$ , where  $a, b$  and  $c$  are integers.  
It is given that  $p'(0) = 12$ .  
It is also given that  $x + 3$  is a factor of  $p$ .  
When  $p$  is divided by  $x - 1$  the remainder is 16.

Find the values of  $a, b$  and  $c$ .

[6]





7 When  $e^{5y}$  is plotted against  $x^3$ , a straight line passing through the points  $(-2.56, 4.38)$  and  $(6.54, 9.84)$  is obtained.

(a) Find  $y$  in terms of  $x$ .

[5]

(b) Find the values of  $x$  for which  $y$  can exist.

[3]

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8 Given that  $f''(x) = (3x+5)^{-\frac{2}{3}}$ ,  $f'(1) = 6$ , and  $f(1) = 20$ , find an expression for  $f(x)$ . [8]

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9 The equation of a curve is  $y = \frac{e^{-3x+2}}{x+1}$  where  $x < -1$ .

(a) Show that  $\frac{dy}{dx} = \frac{e^{-3x+2}}{(x+1)^2}(Ax+B)$  where  $A$  and  $B$  are integers to be found.

[5]

(b) Hence show that there is only one stationary point on the curve and find its exact coordinates. [3]





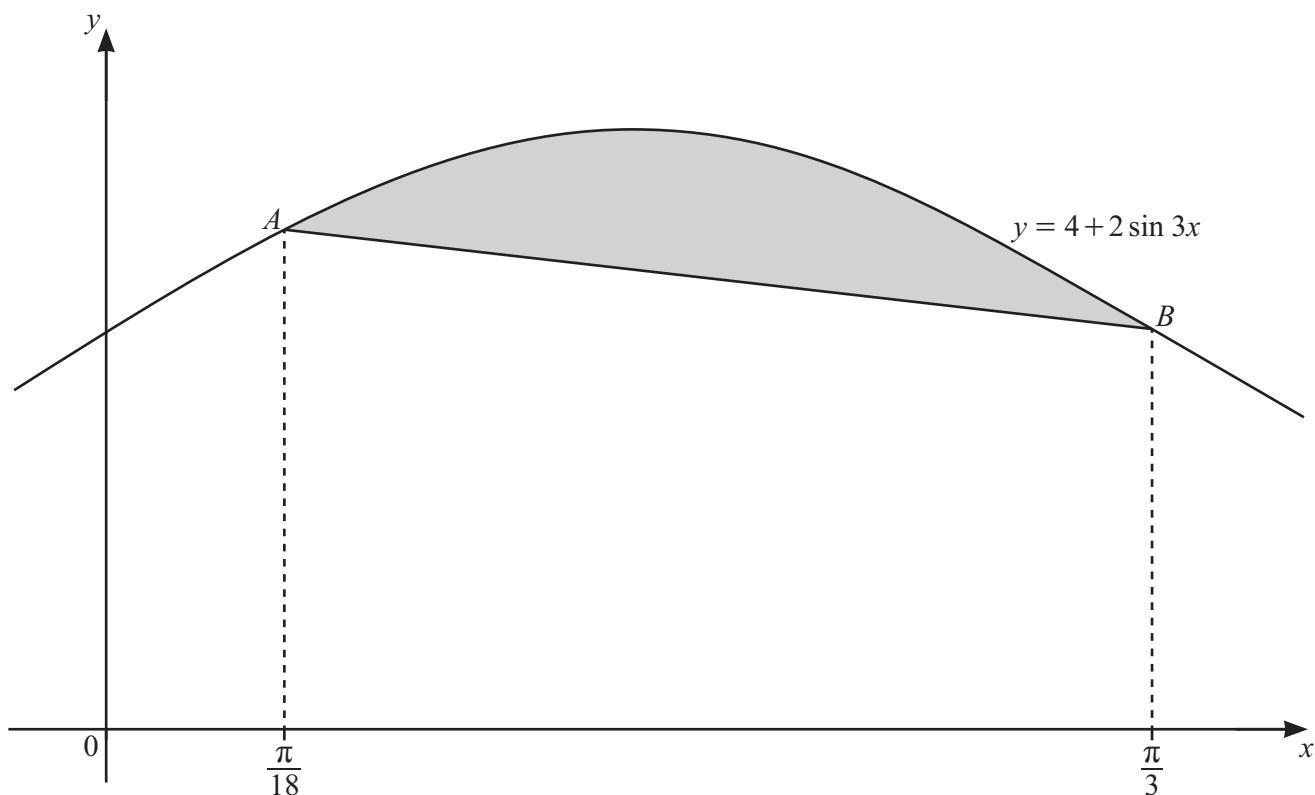
10 (a) The 3rd and 8th terms of a geometric progression are 6 and 1458 respectively. Find the common ratio and the first term of this progression. [4]

(b) The first 3 terms of a second geometric progression are  $\cos\theta$ ,  $2\cos^2\theta$ ,  $4\cos^3\theta$ , where  $-90^\circ < \theta < 90^\circ$ . Find the values of  $\theta$  for which this geometric progression has a sum to infinity. [4]





11



The diagram shows part of the curve  $y = 4 + 2 \sin 3x$  and the straight line  $AB$ . The points  $A$  and  $B$  lie on the curve. The  $x$ -coordinate of  $A$  is  $\frac{\pi}{18}$  and the  $x$ -coordinate of  $B$  is  $\frac{\pi}{3}$ . Find the area of the shaded region, giving your answer in exact form. [9]





Continuation of working space for Question 11.

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12 (a) Solve the equation  $2 \operatorname{cosec}^2 \theta - 5 = 5 \cot \theta$  for  $-180^\circ \leq \theta \leq 180^\circ$ .





(b) Solve the equation  $3 \sin(2\phi + 1.5) = 2$  for  $0 < \phi < 5$ , where  $\phi$  is in radians.

[5]

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