



# Cambridge IGCSE<sup>™</sup>

CANDIDATE NAME						
CENTRE NUMBER				CANDIDATE NUMBER		

## **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  $\pi$ , 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

2

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.

$$V = \frac{1}{3}AV$$

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

$$\sin^2 A + \cos^2 A = 1$$
$$\sec^2 A = 1 + \tan^2 A$$

$$\csc^2 A = 1 + \cot^2 A$$
$$\csc^2 A = 1 + \cot^2 A$$

Formulas for  $\triangle ABC$ 

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\Delta = \frac{1}{2} ab \sin C$$



1 Solve the inequality  $|5x+2| \ge 3$ .

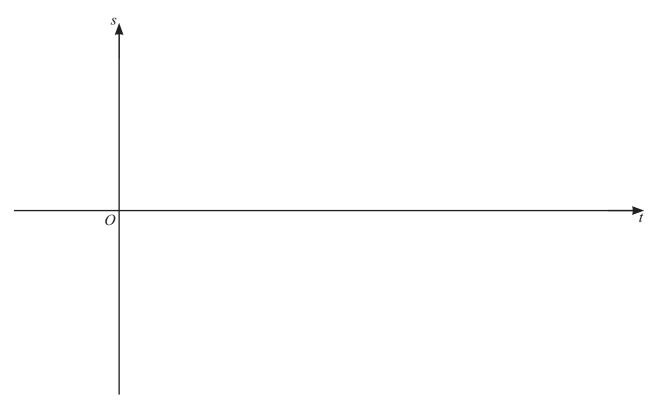
[4]

[Turn over

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  $t \ge 0$ .

(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.



(d) Find an expression for the acceleration, a, of P.

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



[2]

[1]

3 Functions f and g are such that

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

6

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

Solve the equation 
$$fg(x) = 1$$
.

[4]





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

7

[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 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.



Find how many 4-digit numbers can be formed.

DO NOT WRITE IN THIS MARGIN

Find how many even 4-digit numbers can be formed.

[2]

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]



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

9

[6]

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

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

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

\* 000080000011 \*

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

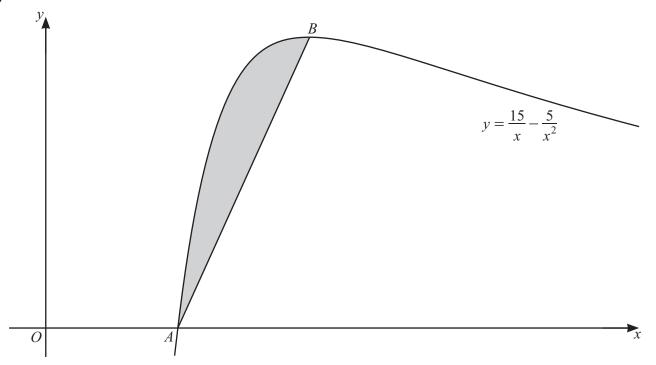
11

[3]

[11]

\* 0000800000012 \*

8



12

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.



Continuation of working space for Question 8.

13



(a) Solve the equation  $3 \sec 3x = \sqrt{3} \csc 3x$  for  $-120^{\circ} \le x \le 120^{\circ}$ .

**14** 

[5]

\* 0000800000015 \* 

**(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  $0 \le y < 2\pi$ . [5]

15

Question 10 is printed on the next page.



10 The first three terms, in descending powers of x, in the expansion of  $(3x^2 - a)^n \left(1 + \frac{1}{x^2}\right)^2$  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]

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