



# Cambridge IGCSE™

CANDIDATE  
NAME

CENTRE  
NUMBER

--	--	--	--	--

CANDIDATE  
NUMBER

--	--	--	--



**ADDITIONAL MATHEMATICS**

**0606/21**

Paper 2

**October/November 2022**

**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  $\triangle ABC$* 

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

3

- 1 Solve the following simultaneous equations, giving your answers in the form  $a + b\sqrt{7}$  where  $a$  and  $b$  are integers.

$$x + 3y = 11$$

$$x - \sqrt{7}y = 7$$

[5]

4

**2 DO NOT USE A CALCULATOR IN THIS QUESTION.**

Find the  $x$ -coordinates of the points where the line  $y = 3x - 8$  cuts the curve  
 $y = 2x^3 + 3x^2 - 26x + 22$ .

[5]

- 3 (a) Find the coordinates of the point on the curve  $y = \sqrt{1+3x}$  where the gradient of the normal is  $-\frac{8}{3}$ . [5]

- (b) Find the equation of the normal to the curve  $y = \sqrt{1+3x}$  at the point (8, 5) in the form  $y = mx + c$ . [3]

## 6

4 Solve the following equations, giving your answers to 3 significant figures.

(a)  $2^{3x+1} = 5^{x-2}$  [3]

(b)  $e^{2y+1} = 1 + \frac{6}{e^{2y+1}}$  [4]

5 You are given that  $y = \frac{1}{\cos 2x}$ .

(a) Show that  $\frac{dy}{dx} = \frac{k \sin 2x}{\cos^2 2x}$  where  $k$  is a constant to be found. [2]

(b) Find the values of  $x$  such that  $\frac{dy}{dx} = \frac{5}{\sin 2x}$  for  $0 < x < \frac{\pi}{2}$ . [4]

6 (a) Write  $3x^2 + 15x - 20$  in the form  $a(x+b)^2 + c$  where  $a$ ,  $b$  and  $c$  are rational numbers. [4]

(b) State the minimum value of  $3x^2 + 15x - 20$  and the value of  $x$  at which it occurs. [2]

(c) Use your answer to **part (a)** to solve the equation  $3y^{\frac{2}{3}} + 15y^{\frac{1}{3}} - 20 = 0$ , giving your answers correct to three significant figures. [3]



- 7 The sum of the first three terms of a geometric progression is 17.5 and the sum to infinity is 20. Find the first term and the common ratio.

[6]

8 The equation of a curve is  $y = x \sin x$ .

(a) Find  $\frac{dy}{dx}$ . [2]

(b) Find the equation of the tangent to the curve at  $x = \frac{\pi}{2}$  in the form  $y = mx + c$ . [3]

(c) Use your answer to **part (a)** to find  $\int x \cos x dx$ . [3]

(d) Evaluate  $\int_0^{\frac{\pi}{4}} x \cos x dx$ , giving your answer correct to 2 significant figures. [2]

## 12

9 The functions  $f(x)$  and  $g(x)$  are defined as follows for  $x > -\frac{1}{3}$  by

$$\begin{aligned}f(x) &= x^2 + 1, \\g(x) &= \ln(3x + 2).\end{aligned}$$

(a) Find  $fg(x)$ . [1]

(b) Solve the equation  $fg(x) = 5$  giving your answer in exact form. [3]

(c) Solve the equation  $gg(x) = 1$ .

[6]

## 14

**10** The acceleration,  $a \text{ ms}^{-2}$ , of a particle at time  $t$  seconds is given by  $a = -\frac{45}{(t+1)^2}$ . When  $t = 0$  the velocity of the particle is  $50 \text{ ms}^{-1}$ .

**(a)** Find an expression for the velocity of the particle in terms of  $t$ . [4]

**(b)** Find the distance travelled by the particle between  $t = 1$  and  $t = 10$ . [4]

**11** A 5-digit code is to be formed using 5 different numbers selected from 1, 2, 3, 4, 5, 6, 7, 8. Find how many possible codes there are if the code forms

(a) a number less than 60 000 that ends in a multiple of 3, [3]

(b) an even number less than 60 000. [3]

**BLANK PAGE**

---

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at [www.cambridgeinternational.org](http://www.cambridgeinternational.org) after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.