

# **Cambridge IGCSE**<sup>™</sup>

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

# 7 1 1 6 2 7 8 8 6 9

### **ADDITIONAL MATHEMATICS**

0606/21

Paper 2 October/November 2021

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  $u_n = a + (n-1)d$ 

$$S_n = \frac{1}{2}n(a+l) = \frac{1}{2}n\left\{2a + (n-1)d\right\}$$

Geometric series  $u_n = ar^{n-1}$ 

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

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

### 2. TRIGONOMETRY

*Identities* 

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

Formulae for  $\triangle ABC$ 

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

1 Solve the inequality (x+5)(x-2) > 3x+6.

[3]

2 Solve the following simultaneous equations.

$$xy + x^2 = 15$$

$$y + 3x = 11$$
 [5]

- 3 A curve has equation  $y = \frac{2 + \sin 3x}{x + 1}$ .
  - (a) Show that the exact value of  $\frac{dy}{dx}$  at the point where  $x = \frac{\pi}{6}$  can be written as  $\frac{k}{\left(\frac{\pi}{6} + 1\right)^2}$ , where k is an integer.

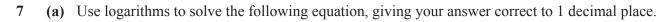
**(b)** Find the equation of the normal to the curve at the point where x = 0. [4]

4 Find rational values a and b such that  $\frac{a}{\sqrt{5}+2} + \frac{b}{\sqrt{5}-2} = 1$ . [5]

- 5 It is given that  $y = 3 \tan^2 x$  for  $0^\circ < x < 360^\circ$ .
  - (a) Show that  $\frac{dy}{dx} = m \tan x \sec^2 x$  where m is an integer to be found. [2]

**(b)** Find all values of x such that  $\frac{dy}{dx} = 3 \sec x \csc x$ . [5]

6 Find the values of m for which the line y = mx - 2 does not touch or cut the curve  $y = (m+1)x^2 + 8x + 1$ . [6]



$$5^{x-2} = 3 \times 2^{2x+3} \tag{4}$$

**(b)** Solve the equation 
$$\log_3(y^2 + 11) - 2 = \log_3(y - 1)$$
. [5]

8

Marc chooses 5 people from 4 men, 4 women and 2 children.									
Find the number of ways that Marc can do this									
(a)	if there are no restrictions,	[1]							
(b)	if at least 2 men are chosen,	[3]							
(c)	if at least 1 man, at least 1 woman and at least 1 child are chosen.	[3]							

9 The following functions are defined for x > 1.

$$f(x) = \frac{x+3}{x-1}$$
  $g(x) = 1+x^2$ 

(a) Find fg(x). [2]

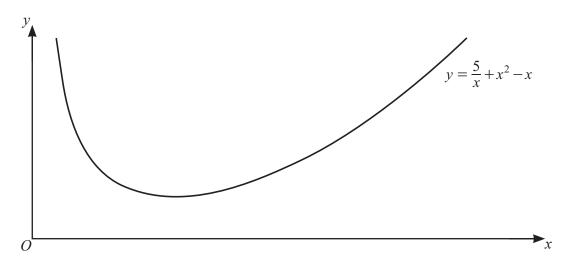
**(b)** Find  $g^{-1}(x)$ . [2]

## (c) DO NOT USE A CALCULATOR IN THIS PART OF THE QUESTION.

Solve the equation f(x) = g(x).

[5]

**10** 



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

(a) Find, in the form y = mx + c, the equation of the tangent to the curve at the point where x = 1.

[5]

(b) Find the exact area enclosed by the curve, the x-axis, and the lines x = 1 and x = 3. [4]

11 The volume, V, of a cone with base radius r and vertical height h is given by  $\frac{1}{3}\pi r^2 h$ . The curved surface area of a cone with base radius r and slant height l is given by  $\pi rl$ .

A cone has base radius r cm, vertical height h cm and volume V cm<sup>3</sup>. The curved surface area of the cone is  $4\pi$  cm<sup>2</sup>.

(a) Show that 
$$h^2 = \frac{16}{r^2} - r^2$$
. [4]

**(b)** Show that 
$$V = \frac{\pi}{3}\sqrt{16r^2 - r^6}$$
. [2]

(c) Given that r can vary and that V has a maximum value, find the value of r that gives the maximum volume. [5]

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