Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

3385575014

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.

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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

$$(a+b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \ldots + \binom{n}{r}a^{n-r}b^r + \ldots + b^n$$

where n is a positive integer and $\binom{n}{r} = \frac{n!}{(n-r)!r!}$

Arithmetic series $\quad u_n = a + (n-1)d$

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

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

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

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

2. TRIGONOMETRY

Identities

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

Formulae for ΔABC

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

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

$$\Delta = \frac{1}{2}bc\sin A$$

1 Solve the 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]

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]

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

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

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

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

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

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

(b) Find the equation of the tangent to the curve at $x = \dfrac{\pi}{2}$ 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]

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

$$\mathrm{f}(x) = x^2 + 1,$$
$$\mathrm{g}(x) = \ln(3x + 2).$$

(a) Find $\mathrm{fg}(x)$. [1]

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

(c) Solve the equation $gg(x) = 1$. [6]

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

(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]

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