

Cambridge IGCSE[™]

| CANDIDATE NAME | | | | | |
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| CENTRE NUMBER | | | CANDIDATE NUMBER | | |

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ADDITIONAL MATHEMATICS

0606/22

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

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

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

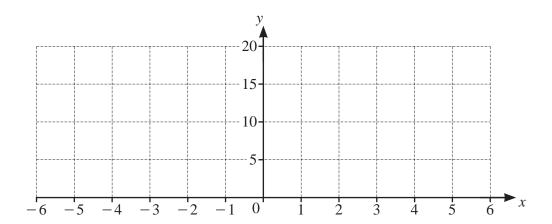
Identities

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

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



- (a) On the axes, draw the graphs of y = 5 + |3x-2| and y = 11-x. [4]
- (b) Using the graphs, or otherwise, solve the inequality 11-x < 5+|3x-2|. [2]

2 (a) Expand $(2-3x)^4$, evaluating all of the coefficients.

[4]

(b) The sum of the first three terms in ascending powers of x in the expansion of $(2-3x)^4 \left(1 + \frac{a}{x}\right)$ is $\frac{32}{x} + b + cx$, where a, b and c are integers. Find the values of each of a, b and c. [4]

3 (a) Show that
$$\frac{1}{\sec x - 1} + \frac{1}{\sec x + 1} = 2 \cot x \csc x$$
. [4]

(b) Hence solve the equation
$$\frac{1}{\sec x - 1} + \frac{1}{\sec x + 1} = 3\sec x$$
 for $0^{\circ} < x < 360^{\circ}$. [4]

| 4 | (a) | Find the <i>x</i> -coordinates of the stationary points on the curve | $y = 3 \ln x + x^2 - 7x$, where $x > 0$. |
|---|-----|--|--|
| | | | [5] |

(b) Determine the nature of each of these stationary points.

[3]

5 (a) Solve the following simultaneous equations.

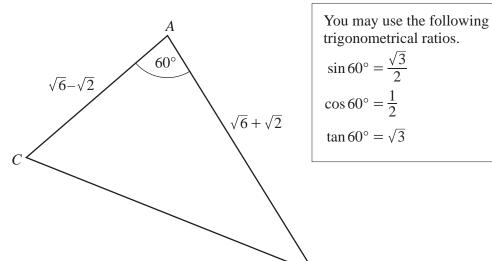
$$e^{x} + e^{y} = 5$$

 $2e^{x} - 3e^{y} = 8$ [5]

(b) Solve the equation
$$e^{(2t-1)} = 5e^{(5t-3)}$$
. [4]

6 DO NOT USE A CALCULATOR IN THIS QUESTION.

All lengths in this question are in centimetres.



The diagram shows triangle ABC with $AC = \sqrt{6} - \sqrt{2}$, $AB = \sqrt{6} + \sqrt{2}$ and angle $CAB = 60^{\circ}$.

(a) Find the exact length of BC.

[3]

(b) Show that
$$\sin ACB = \frac{\sqrt{6} + \sqrt{2}}{4}$$
.

(c) Show that the perpendicular distance from *A* to the line *BC* is 1.

[2]

[2]

7 It is given that $\frac{d^2y}{dx^2} = e^{2x} + \frac{1}{(x+1)^2}$ for x > -1.

(a) Find an expression for
$$\frac{dy}{dx}$$
 given that $\frac{dy}{dx} = 2$ when $x = 0$. [3]

(b) Find an expression for y given that
$$y = 4$$
 when $x = 0$. [3]

| 8 | Variables x and y are such that when \sqrt{y} is plotted against $\log_2(x+1)$, where $x \ge -1$, a straight line is |
|---|--|
| | obtained which passes through (2, 10.4) and (4, 15.4). |

(a) Find \sqrt{y} in terms of $\log_2(x+1)$. [4]

(b) Find the value of y when x = 15. [1]

(c) Find the value of x when y = 25.

[3]

9 (a) Find the equation of the normal to the curve $y = x^3 + x^2 - 4x + 6$ at the point (1, 4). [5]

| (b) | DO NOT | USE A CAL | CULATOR | IN THIS PART | OF THE | DUESTION. |
|------------|--------|-----------|---------|--------------|--------|-----------|
| | | | | | | |

Find the exact *x*-coordinate of each of the two points where the normal cuts the curve again. [5]

10 (a) The first three terms of an arithmetic progression are x, 5x-4 and 8x+2. Find x and the common difference. [4]

| (b) | The | The first three terms of a geometric progression are y , $5y-4$ and $8y+2$. | | | | | | | |
|------------|------|--|-----|--|--|--|--|--|--|
| | (i) | Find the two possible values of <i>y</i> . | [4] | | | | | | |
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| | (ii) | For each of these values of y, find the corresponding value of the common ratio. | [2] | | | | | | |
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