

Cambridge IGCSE[™]

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

270919052

ADDITIONAL MATHEMATICS

0606/13

Paper 1 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

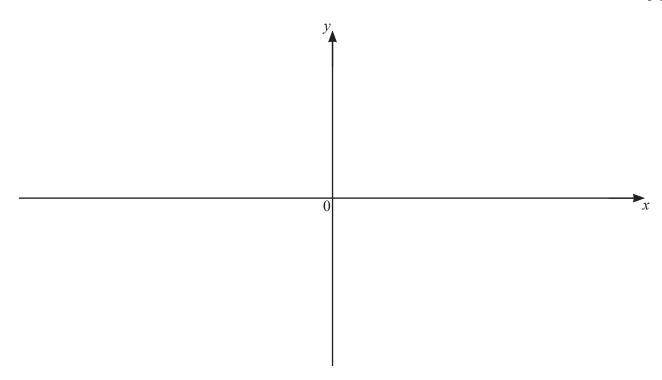
Identities

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

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 On the axes below, sketch the graph of $y = -\frac{1}{4}(2x+1)(x-3)(x+4)$ stating the intercepts with the coordinate axes. [3]



A particle moves in a straight line such that its velocity, $v \,\text{ms}^{-1}$, at time t seconds after passing through a fixed point O, is given by $v = e^{3t} - 25$. Find the speed of the particle when t = 1. [2]

3 Solve the equation $\cot^2(2x - \frac{\pi}{3}) = \frac{1}{3}$, where x is in radians and $0 \le x < \pi$. [5]

4 (a) Find the first three terms, in ascending powers of x^2 , in the expansion of $\left(\frac{1}{2} - \frac{2}{3}x^2\right)^8$. Write your coefficients as rational numbers. [3]

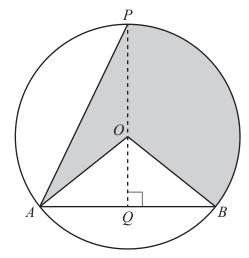
(b) Find the coefficient of x^2 in the expansion of $\left(\frac{1}{2} - \frac{2}{3}x^2\right)^8 \left(2x + \frac{1}{x}\right)^2$. [3]

5	A ge	eometric progression is such that its sum to 4 terms is 17 times its sum to 2 terms. It is given that amon ratio of this geometric progression is positive and not equal to 1.	s. It is given that the	
	(a)	Find the common ratio of this geometric progression.	[3]	
	(b)	Given that the 6th term of the geometric progression is 64, find the first term.	[2]	
	(c)	Explain why this geometric progression does not have a sum to infinity.	[1]	

6 (a) A 5-digit number is made using the digits 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. No digit may be used more than once in any 5-digit number. Find how many such 5-digit numbers are odd and greater than 70 000.

(b) The number of combinations of n objects taken 3 at a time is 2 times the number of combinations of n objects taken 2 at a time. Find the value of n. [4]

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The diagram shows a circle, centre O, radius $10 \, \text{cm}$. The points A, B and P lie on the circumference of the circle. The chord AB is of length $14 \, \text{cm}$. The point Q lies on AB and the line POQ is perpendicular to AB.

(a) Show that angle *POA* is 2.366 radians, correct to 3 decimal places. [2]

(b) Find the area of the shaded region.

[3]

(c) Find the perimeter of the shaded region.

[5]

(a) Show that the mid-point of the line AB is (2, 9).

[5]

The line l is the perpendicular bisector of AB.

(b) Show that the point C(12, 7) lies on the line l.

[3]

(c) The point *D* also lies on *l*, such that the distance of *D* from *AB* is two times the distance of *C* from *AB*. Find the coordinates of the two possible positions of *D*. [4]

9	Who	When e^{2y} is plotted against x^2 , a straight line graph passing through the points $(4, 7.96)$ and $(2, 3.76)$ is obtained.							
		Find y in terms of x . [5]							
	(b)	Find y when $x = 1$. [2]							
	(c)	Using your equation from part (a), find the positive values of x for which the straight line exists. [3]							

10 A curve with equation y = f(x) is such that $\frac{d^2y}{dx^2} = (2x+3)^{-\frac{1}{2}} + 5$ for x > 0. The curve has gradient 10 at the point $\left(3, \frac{19}{2}\right)$.

(a) Show that, when
$$x = 11$$
, $\frac{dy}{dx} = 52$. [5]

(b) Find f(x). [4]

11 A curve has equation $y = \frac{\left(x^2 - 5\right)^{\frac{1}{3}}}{x + 1}$ for x > -1.

(a) Show that
$$\frac{dy}{dx} = \frac{Ax^2 + Bx + C}{3(x+1)^2(x^2-5)^{\frac{2}{3}}} \text{ where } A, B \text{ and } C \text{ are integers.}$$
 [6]

(b)	Find the <i>x</i> -coordinate of the stationary point on the curve.	[2]
(c)	Explain how you could determine the nature of this stationary point. [You are not required to find the nature of this stationary point.]	[2]

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