Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

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.

© UCLES 2021

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

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

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

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

Formulae for ΔABC

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

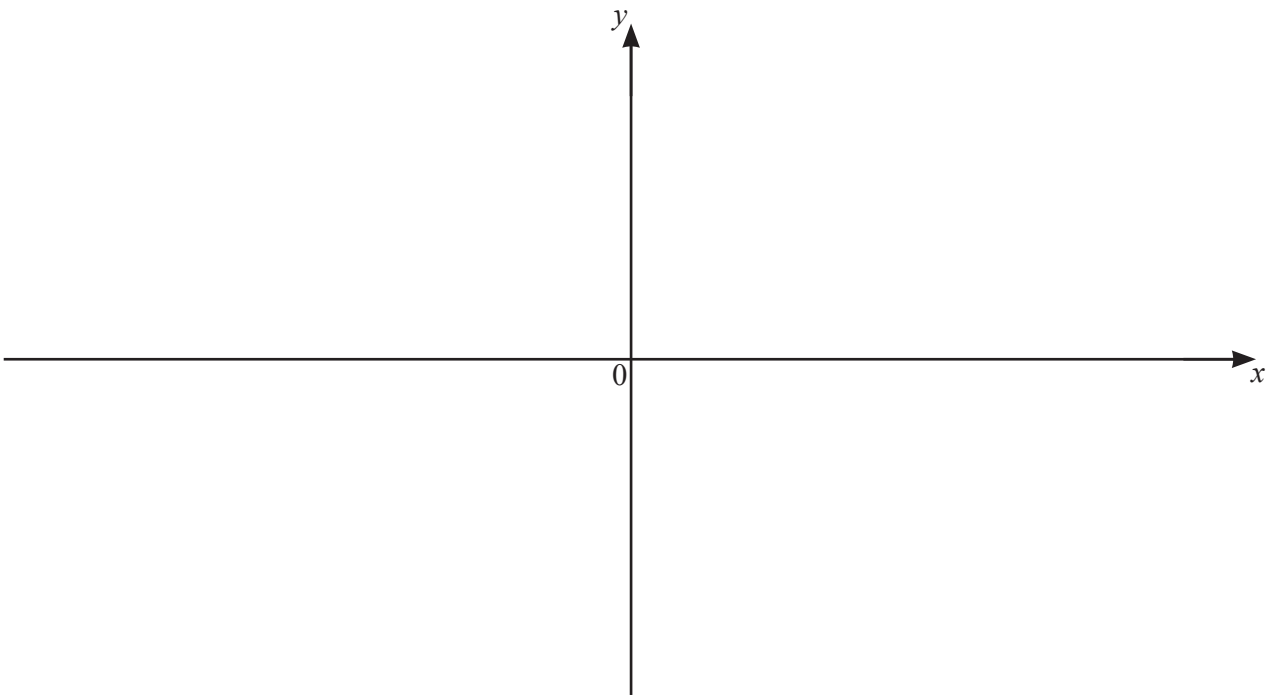
$$a^2 = b^2 + c^2 - 2bc\cos A$$

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

© UCLES 2021

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]

View solution



2 A particle moves in a straight line such that its velocity, v 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]

View solution

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

View solution

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]

View solution

(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]

View solution

© UCLES 2021

5 A geometric progression is such that its sum to 4 terms is 17 times its sum to 2 terms. It is given that the common ratio of this geometric progression is positive and not equal to 1.

(a) Find the common ratio of this geometric progression. [3]

View solution

(b) Given that the 6th term of the geometric progression is 64, find the first term. [2]

View solution

(c) Explain why this geometric progression does not have a sum to infinity. [1]

View solution

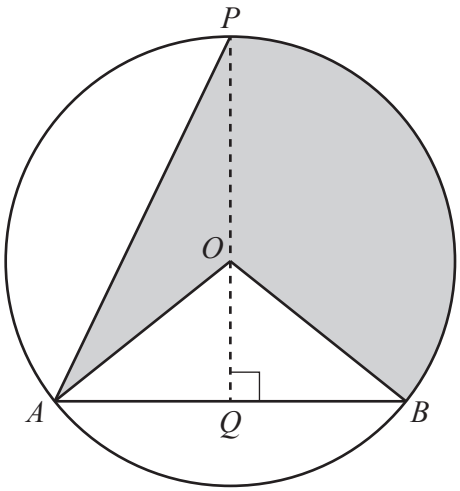
6 **(a)** A 5-digit number is made using the digits 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. No digit may be used more than once in any 5-digit number. Find how many such 5-digit numbers are odd and greater than 70 000. [3]

View solution

(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]

View solution

7



The diagram shows a circle, centre O, radius 10 cm. The points A, B and P lie on the circumference of the circle. The chord AB is of length 14 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]

View solution

(b) Find the area of the shaded region. [3]

View solution

(c) Find the perimeter of the shaded region. [5]

View solution

8 The curves $y = x^2 + x - 1$ and $2y = x^2 + 6x - 2$ intersect at the points A and B.

(a) Show that the mid-point of the line AB is (2, 9). [5]

View solution

The line l is the perpendicular bisector of AB.

(b) Show that the point C (12, 7) lies on the line l. [3]

View solution

(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]

View solution

9 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.

(a) Find y in terms of x. [5]

View solution

(b) Find y when $x = 1$. [2]

View solution

(c) Using your equation from **part (a)**, find the positive values of x for which the straight line exists. [3]

View solution

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]

View solution

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

View solution

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

(a) Show that $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{Ax^2 + Bx + C}{3\left(x + 1\right)^2\left(x^2 - 5\right)^{\frac{2}{3}}}$ where A, B and C are integers. [6]

View solution

(b) Find the x-coordinate of the stationary point on the curve. [2]

View solution

(c) Explain how you could determine the nature of this stationary point. [2]
[You are not required to find the nature of this stationary point.]

View solution

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 after the live examination series.

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