



Cambridge IGCSE™

CANDIDATE
NAME

--

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



ADDITIONAL MATHEMATICS

0606/11

Paper 1

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.

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 $u_n = ar^{n-1}$

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

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

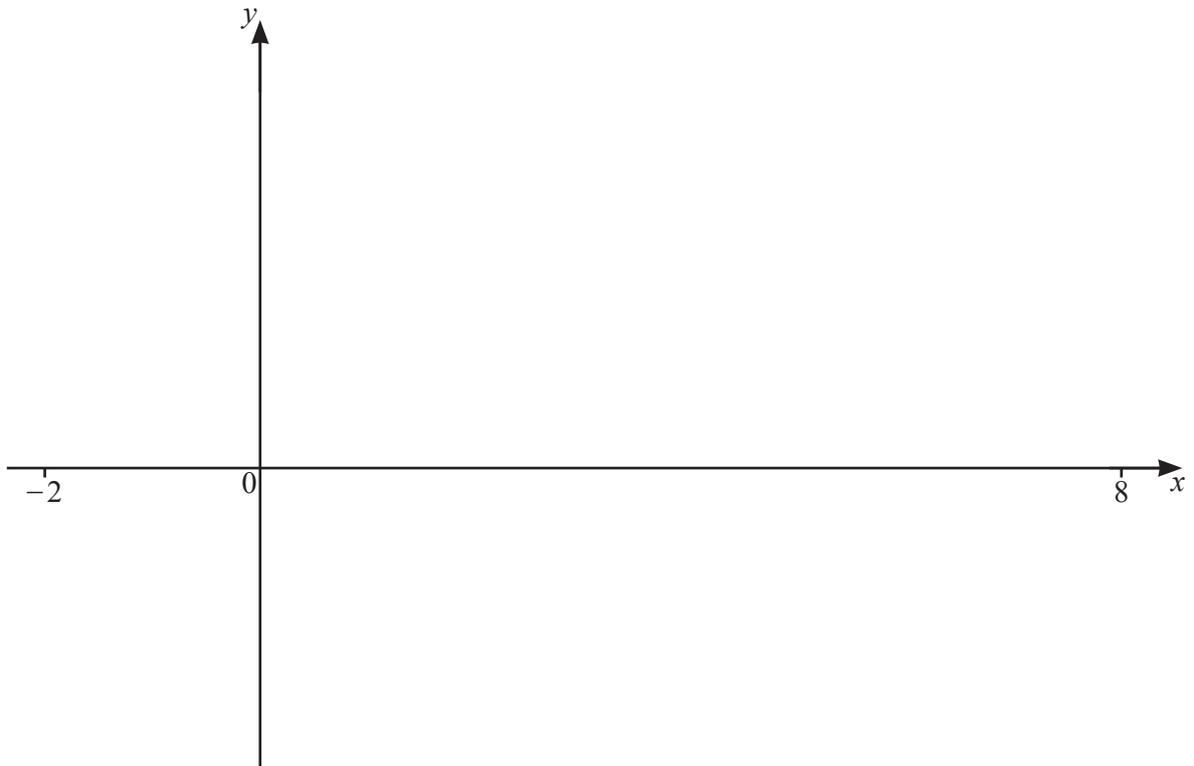
2. TRIGONOMETRY*Identities*

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

Formulae for $\triangle ABC$

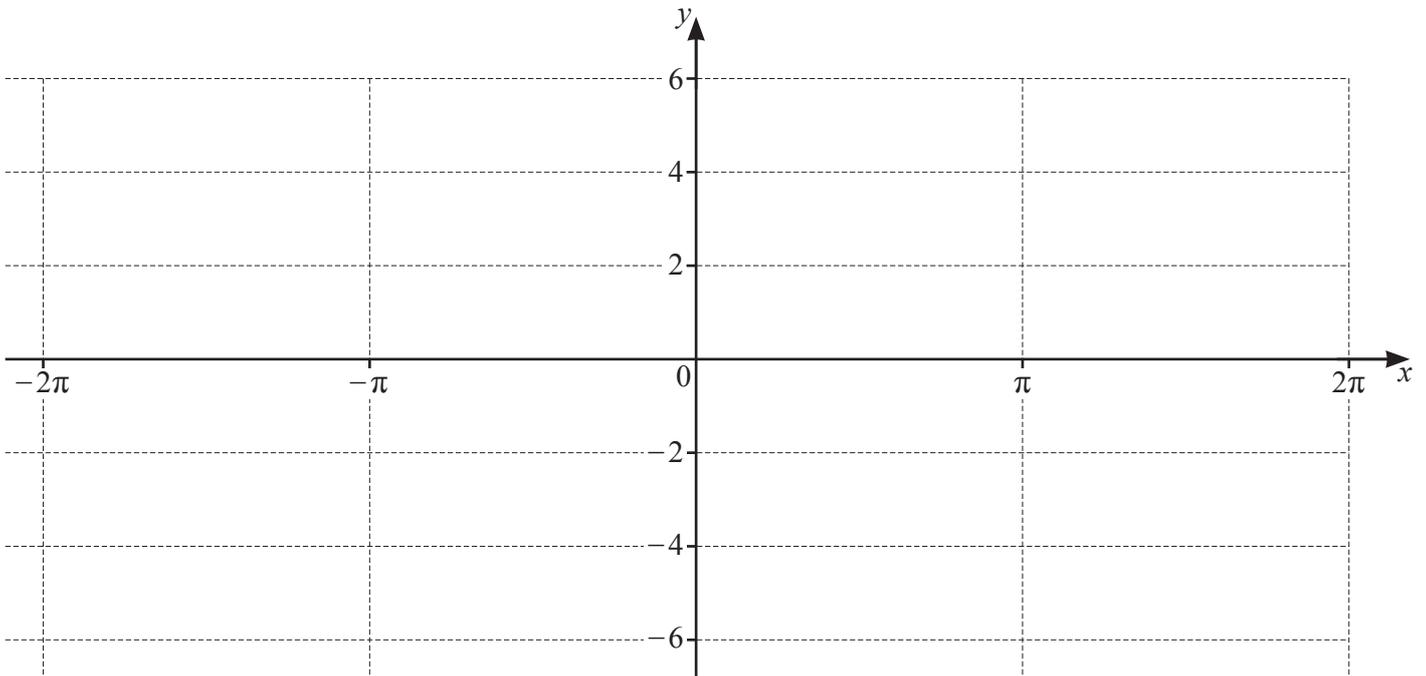
$$\begin{aligned} \frac{a}{\sin A} &= \frac{b}{\sin B} = \frac{c}{\sin C} \\ a^2 &= b^2 + c^2 - 2bc \cos A \\ \Delta &= \frac{1}{2}bc \sin A \end{aligned}$$

- 1 (a) On the axes, sketch the graphs of $y = |2x + 1|$ and $y = |5 - 3x|$ for $-2 \leq x \leq 8$. State the coordinates of the points where these graphs meet the coordinate axes. [3]



- (b) Solve the equation $|2x + 1| = |5 - 3x|$. [3]

- 2 (a) On the axes, sketch the graph of $y = 5 \sin \frac{x}{2} + 1$ for $-2\pi \leq x \leq 2\pi$. [3]



- (b) Write down the amplitude of $5 \sin \frac{x}{2} + 1$. [1]

- (c) Write down the period of $5 \sin \frac{x}{2} + 1$. [1]

- 3 When y^3 is plotted against $\ln x$, a straight line graph is obtained, passing through the points (1, 5) and (6, 15). Find y in terms of x . [4]

4 DO NOT USE A CALCULATOR IN THIS QUESTION.

Solve the equation $(\sqrt{5} - 1)x^2 - 2x - (\sqrt{5} + 1) = 0$, giving your answers in the form $a + b\sqrt{5}$, where a and b are constants. [6]

5 An arithmetic progression is such that the fourth term is 25 and the ninth term is 50.

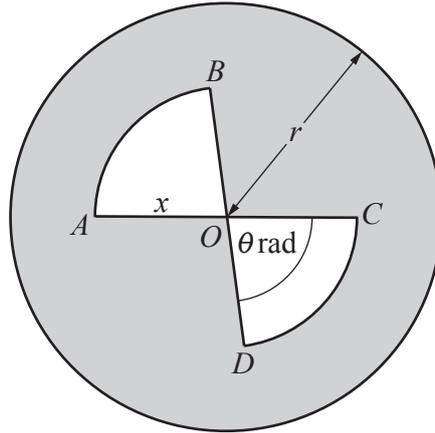
(a) Find the first term and the common difference.

[3]

(b) Find the least number of terms for which the sum of the progression is greater than 25 000.

[3]

- 6 The first three terms, in ascending powers of x , in the expansion of $\left(1 - \frac{2x}{9}\right)^{18} (1 + 3x)^3$ are written in the form $1 + ax + bx^2$, where a and b are constants. Find the exact values of a and b . [7]



The diagram shows a circle with centre O and radius r . OAB and OCD are sectors of a circle with centre O and radius x , where $0 < x \leq r$. Angle $AOB = \text{angle } COD = \theta$ radians, where $0 < \theta < \pi$.

(a) Find, in terms of r , x and θ , the perimeter of the shaded region. [3]

(b) Find, in terms of r , x and θ , the area of the shaded region. [1]

It is given that x can vary and that r and θ are constant.

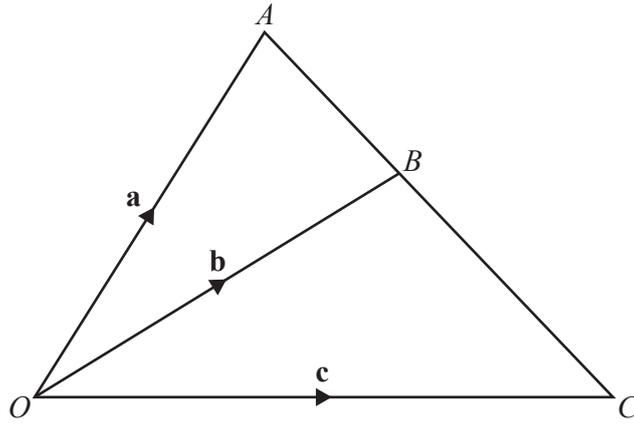
(c) Write down the least possible area of the shaded region in terms of r and θ . [2]

- 8 Find $\int_0^a \left(\frac{2}{x+1} - \frac{1}{x+2} \right) dx$, where a is a positive constant. Give your answer, as a single logarithm, in terms of a . [5]

- 9 Solve the equation $2 \log_p y + 10 \log_y p - 9 = 0$, where p is a positive constant, giving y in terms of p . [5]

- 10 Given that $65 \times {}^n C_5 = 2(n-1) \times {}^{n+1} C_6$, find the value of n . [3]

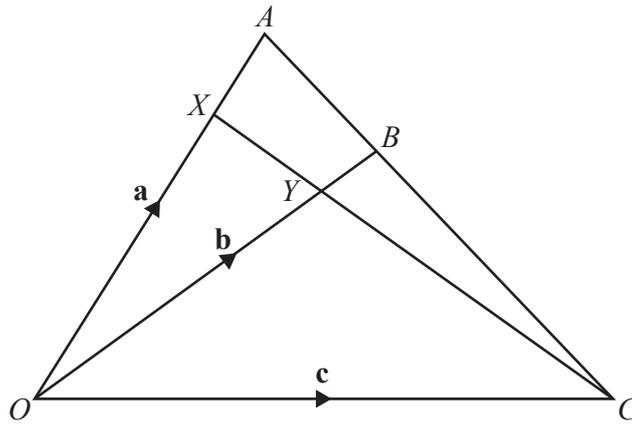
11



The diagram shows a triangle OAC . The point B lies on AC such that $AB : AC = 2 : 5$. It is given that $\vec{OA} = \mathbf{a}$, $\vec{OB} = \mathbf{b}$ and $\vec{OC} = \mathbf{c}$.

(a) Show that $5\mathbf{b} - 3\mathbf{a} = 2\mathbf{c}$.

[4]



The diagram now includes points X and Y , such that $\overrightarrow{OX} = \frac{3}{4}\overrightarrow{OA}$ and $\overrightarrow{OY} = m\overrightarrow{OB}$, where m is a constant. It is also given that $XY : XC = \lambda : 1$, where λ is a constant.

(b) Using **part (a)**, find \overrightarrow{XC} in terms of **a** and **b**. [2]

(c) Hence find the values of m and λ . [4]

12 (a) Show that $\frac{1}{\operatorname{cosec} \theta - 1} + \frac{1}{\operatorname{cosec} \theta + 1} = 2 \sin \theta \sec^2 \theta$. [3]

(b) Hence solve the equation $\frac{1}{\operatorname{cosec} 2\phi - 1} + \frac{1}{\operatorname{cosec} 2\phi + 1} = 4 \sin 2\phi$, for $-90^\circ \leq \phi \leq 90^\circ$. [6]

- 13 Given that $f''(x) = 6(3x+4)^{-\frac{1}{2}}$, $f'(4) = 18$ and $f(4) = \frac{512}{9}$, find $f(x)$. [8]

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 Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.