

**Cambridge IGCSE™**CANDIDATE
NAMECENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--

ADDITIONAL MATHEMATICS**0606/13**

Paper 1

October/November 2024**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 $\triangle ABC$

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



* 0000800000003 *



3

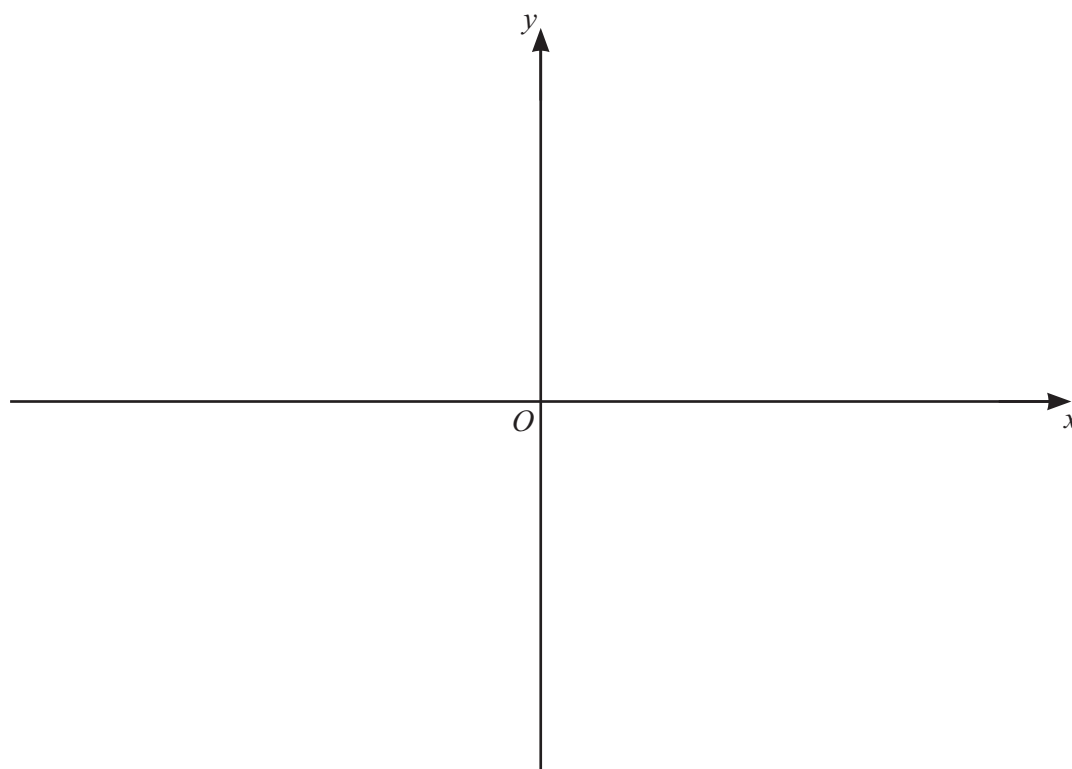


- 1 (a) Find the coordinates of the stationary point on the curve $y = (x+3)(x-4)$.

[3]

- (b) On the axes, sketch the graph of $y = |(x+3)(x-4)|$, stating the intercepts with the axes.

[2]



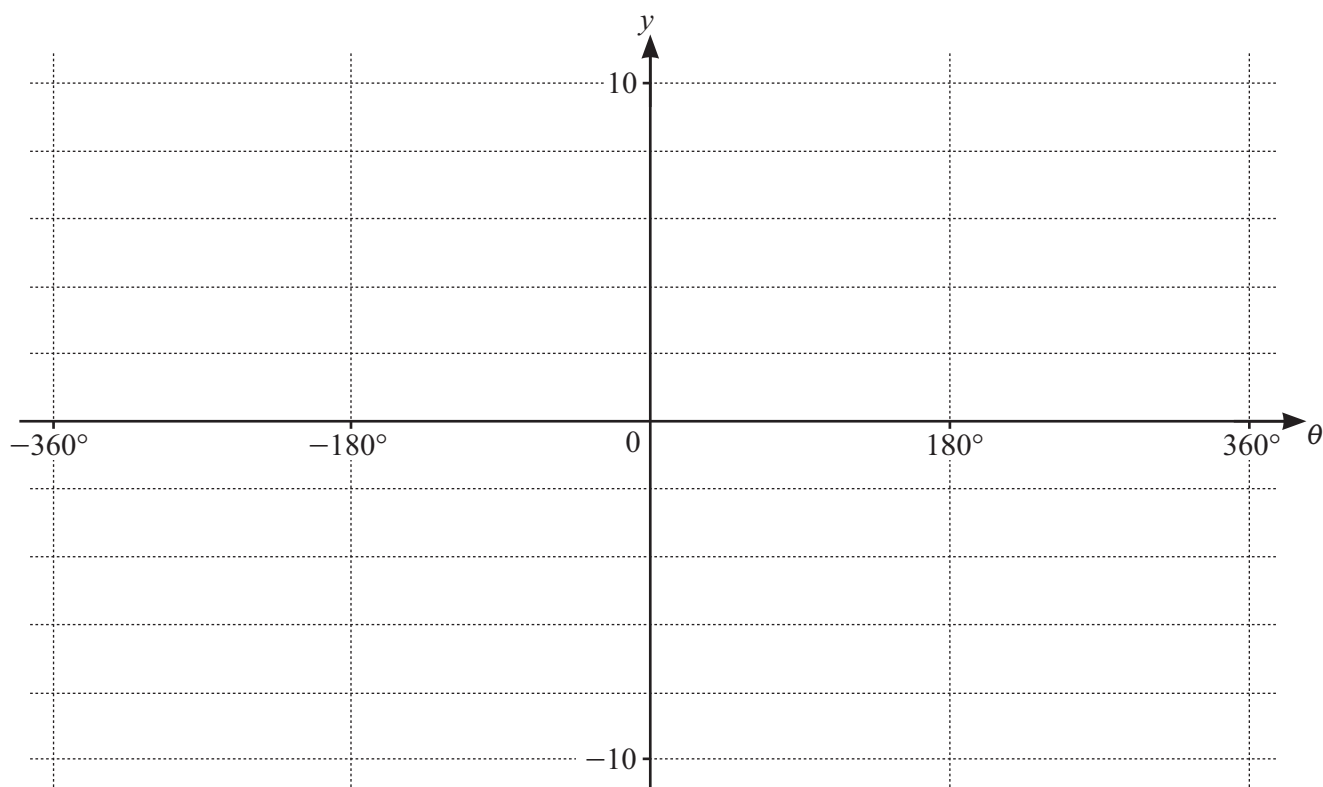
- (c) Given that $k > 0$, write down the values of k for which the equation $|(x+3)(x-4)| = k$ has exactly 2 distinct real roots.

[1]





- 2 On the axes, sketch the graph of $y = 4 + 5 \sin \frac{\theta}{2}$, for $-360^\circ \leq \theta \leq 360^\circ$. State the intercept with the y -axis. [4]



* 0000800000005 *



5



3 Find the values of k for which the equation $4x^2 - k = 4kx - 2$ has no real roots.

[4]



* 0000800000006 *



6



4 (a) Write $3 + 4 \log_2 a - \log_2 b$ as a single base 2 logarithm.

[3]

(b) Solve the equation $\lg x = 4 \log_x 10$.

[4]





- 5 The polynomial p is such that $p(x) = ax^3 + bx^2 - 19x + c$, where a , b and c are integers. It is given that $x + 2$ is a factor of $p(x)$. When $p(x)$ is divided by $x + 1$ the remainder is 20.

(a) Show that $7a - 3b = 39$. [3]

It is also given that when $p'(x)$ is divided by $x - 1$ the remainder is 1.

(b) Find the values of a , b and c . [3]



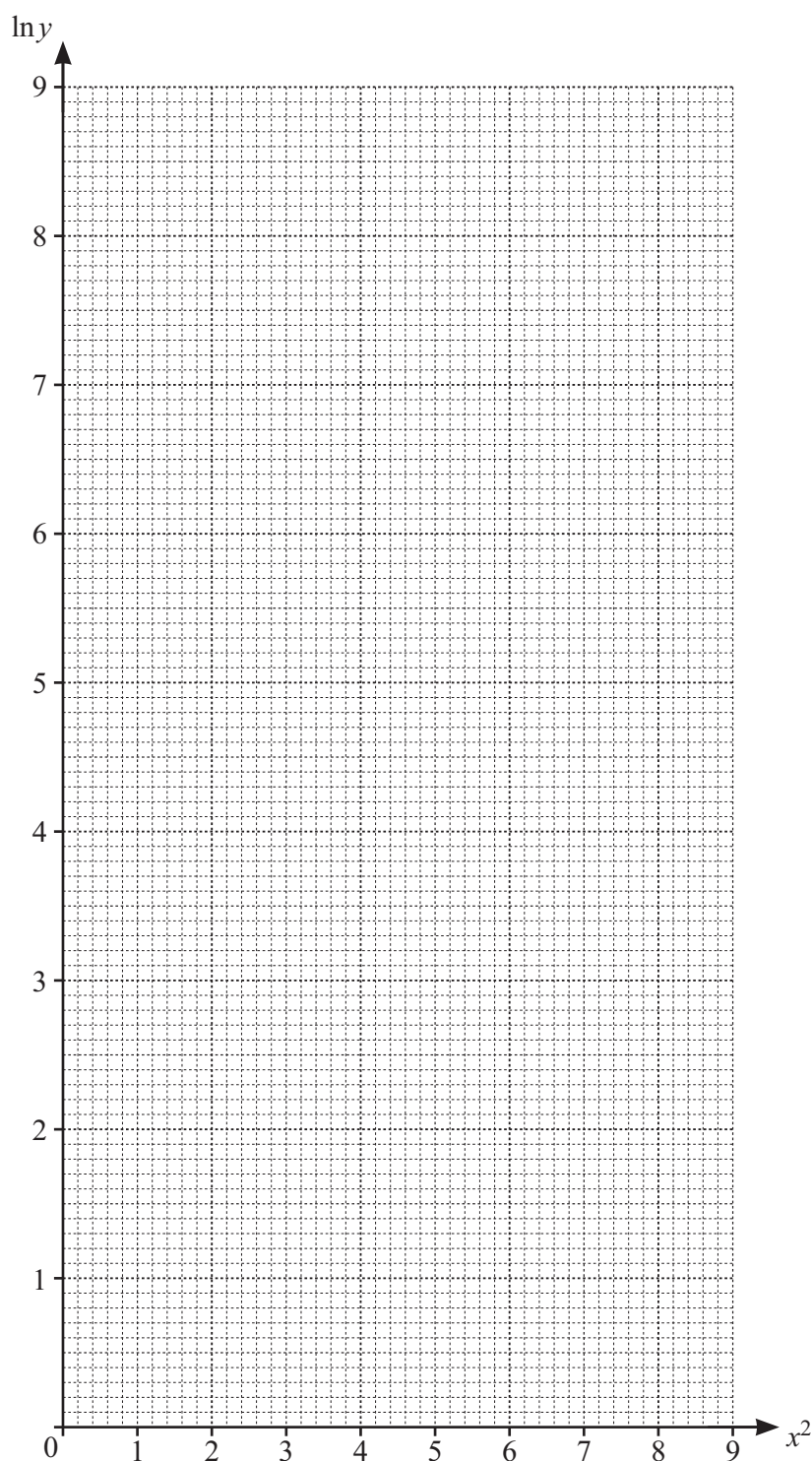


- 6 The table shows the variables x and y which are related by the equation $y = Ab^{x^2}$, where A and b are constants.

x	1	1.5	2	2.5	3
y	14	33.3	112	532.8	3584

- (a) Use the data to draw a straight line graph of $\ln y$ against x^2 .

[2]



* 0000800000009 *



9



- (b) Use your graph to estimate the values of A and b . Give your answers correct to 1 significant figure. [5]

- (c) Use your graph to estimate the value of x when $y = 200$. Give your answer correct to 2 significant figures. [2]





7 (a) Given that $y = x^3 \ln x$, find $\frac{dy}{dx}$.

[2]

(b) Hence find $\int_1^2 3x^2 \ln x \, dx$, giving your answer in the form $\ln a + b$, where a is an integer and b is a rational number.

[4]





- 8 The straight line $y = 2x + 1$ intersects the curve $y + xy + 3x^2 = 15$ at the points A and B . The point C with coordinates $\left(\frac{21}{10}, k\right)$ lies on the perpendicular bisector of AB .

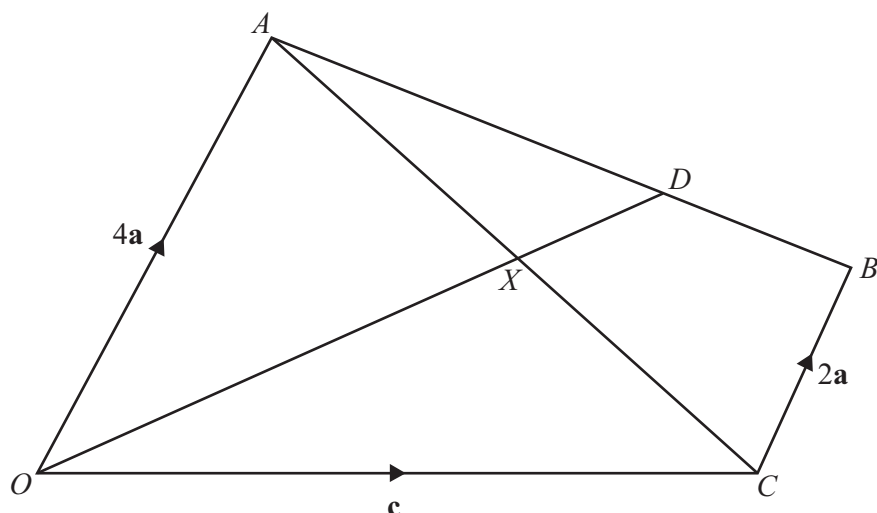
(a) Find the exact value of k .

[8]

- (b) The point D lies on the perpendicular bisector of AB such that its perpendicular distance from AB is twice that of the point C from AB . Find the possible coordinates of D .

[4]





The diagram shows the trapezium $OABC$, where $\overrightarrow{OA} = 4\mathbf{a}$, $\overrightarrow{OC} = \mathbf{c}$, and $\overrightarrow{CB} = 2\mathbf{a}$. The point D lies on AB such that $AD:DB = 2:1$. The point X is the point of intersection of the lines OD and AC . It is given that $\overrightarrow{AX} = \lambda\overrightarrow{AC}$ and $\overrightarrow{OX} = \mu\overrightarrow{OD}$.

Find in terms of $\mathbf{a}$ and $\mathbf{c}$

(a) $\overrightarrow{AB}$ [1]

(b) $\overrightarrow{OD}$. [2]

(c) Find $\overrightarrow{OX}$ in terms of $\mathbf{a}$, $\mathbf{c}$ and μ . [1]

(d) Find $\overrightarrow{AX}$ in terms of $\mathbf{a}$, $\mathbf{c}$ and λ . [2]



* 0000800000013 *



13



(e) Hence find the values of λ and μ .

[4]





10 (a) Solve the equation $7 \tan^2 \theta + 5 \tan \theta - 2 = 0$, for $-180^\circ \leq \theta \leq 180^\circ$.

[4]

(b) Solve the equation $3 \sin(3\phi - 1.5) - 2 = 0$, for $0 < \phi < 3$, where ϕ is in radians.

[5]





- 11 (a) The first 3 terms of an arithmetic progression are $\log_x 3$, $\log_x 81$, $\log_x 2187$. Find the sum to n terms, giving your answer in the form $k \log_x 3$, where k is in terms of n . [3]

- (b) The first 3 terms of a geometric progression are 1 , $3 \tan^2 \theta$, $9 \tan^4 \theta$, for $0 < \theta < \frac{\pi}{2}$.

Find the values of θ for which this geometric progression has a sum to infinity. [4]



**BLANK PAGE**

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

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.

