



Cambridge IGCSE™

CANDIDATE
NAME

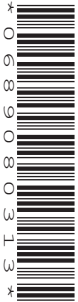
--

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



ADDITIONAL MATHEMATICS

0606/11

Paper 1

May/June 2023

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 [].

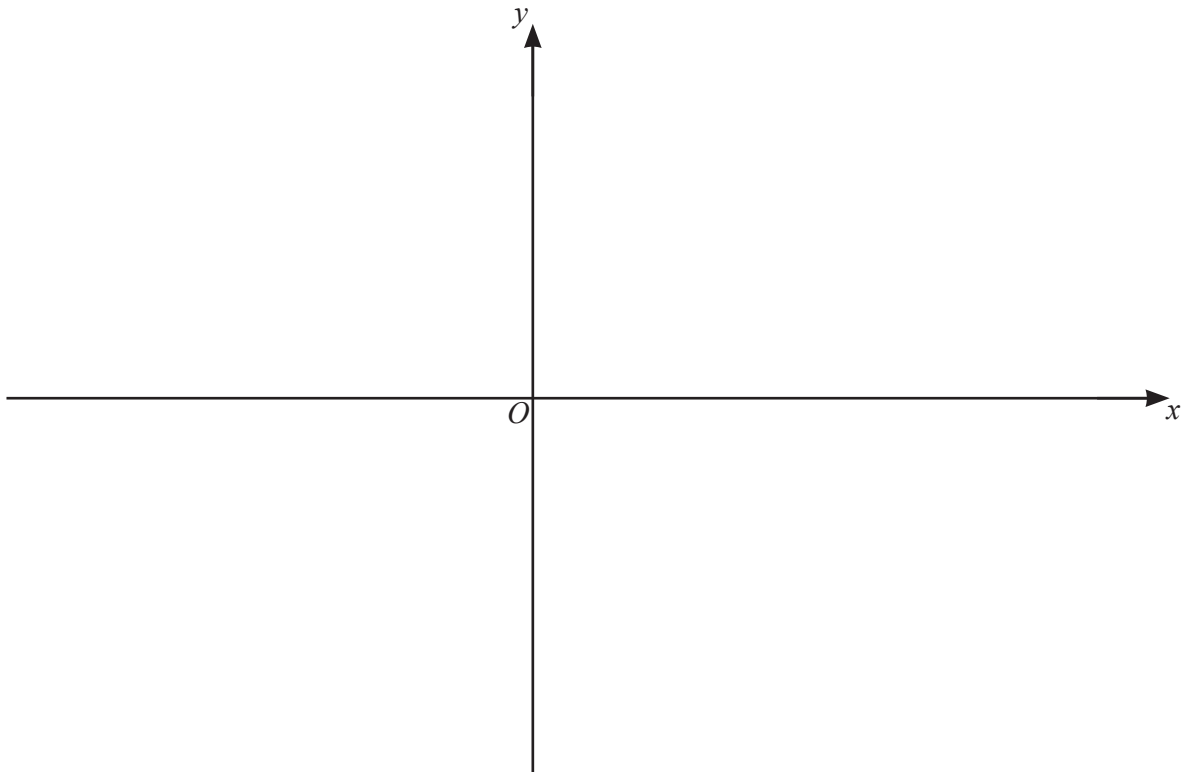
This document has **16** pages.

- 1 (a) Write $5x^2 - 14x + 8$ in the form $a(x+b)^2 + c$, where a , b and c are constants to be found. [3]

7

- (b) Hence write down the coordinates of the stationary point on the curve $y = 5x^2 - 14x + 8$. [2]

- (c) On the axes below, sketch the graph of $y = |5x^2 - 14x + 8|$, stating the coordinates of the points where the graph meets the coordinate axes. [3]



- (d) Write down the range of values of k for which the equation $|5x^2 - 14x + 8| = k$ has 4 distinct roots. [2]

2 The polynomial p is such that $p(x) = ax^3 + 7x^2 + bx + c$, where a , b and c are integers.



(a) Given that $p''\left(\frac{1}{2}\right) = 32$, show that $a = 6$. [2]

(b) Given that $p(x)$ has a factor of $3x - 4$ and a remainder of 7 when divided by $x + 1$, find the values of b and c . [4]

(c) Write $p(x)$ in the form $(3x - 4)q(x)$, where $q(x)$ is a quadratic factor. [2]

(d) Hence write $p(x)$ as a product of linear factors with integer coefficients. [1]

3 The points A and B have coordinates $(2, 5)$ and $(10, -15)$ respectively. The point P lies on the perpendicular bisector of the line AB . The y -coordinate of P is -9 .

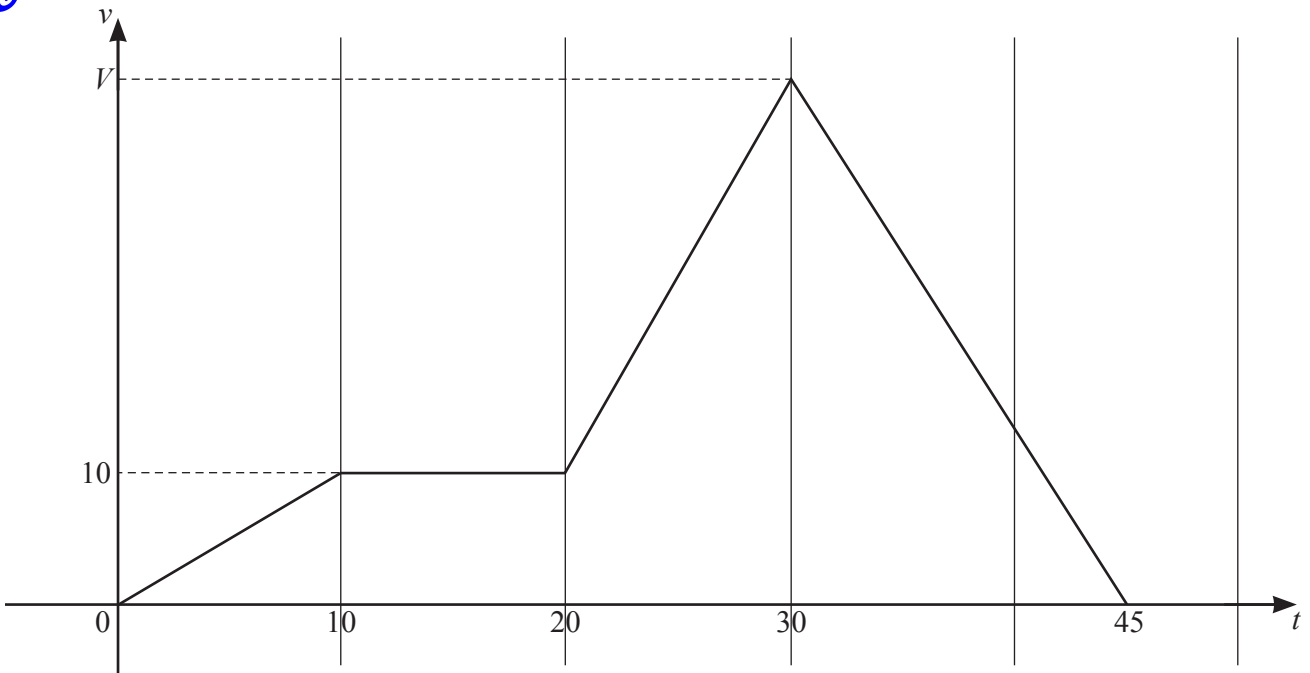


(a) Find the x -coordinate of P .

[5]

(b) The point R is the reflection of P in the line AB . Find the coordinates of R .

[2]

4
7

The diagram shows the velocity–time graph for a particle travelling in a straight line with velocity, $v \text{ ms}^{-1}$, at time t seconds. When $t = 30$ the velocity of the particle is $V \text{ ms}^{-1}$. The particle travels 800 metres in 45 seconds.

(a) Find the value of V . [2]

(b) Find the acceleration of the particle when $t = 35$. [2]

5 DO NOT USE A CALCULATOR IN THIS QUESTION.

In this question, all lengths are in centimetres.

- (a) You are given that $\cos 120^\circ = -\frac{1}{2}$, $\sin 120^\circ = \frac{\sqrt{3}}{2}$ and $\tan 120^\circ = -\sqrt{3}$.

In the triangle ABC , $AB = 5\sqrt{3} - 6$, $BC = 5\sqrt{3} + 6$ and angle $ABC = 120^\circ$. Find AC , giving your answer in the form $a\sqrt{b}$ where a and b are integers greater than 1. [4]

- (b) You are given that $\cos 30^\circ = \frac{\sqrt{3}}{2}$, $\sin 30^\circ = \frac{1}{2}$ and $\tan 30^\circ = \frac{1}{\sqrt{3}}$.

In the triangle PQR , $PQ = 3 + 2\sqrt{5}$ and angle $PQR = 30^\circ$. Given that the area of this triangle is $\frac{2+5\sqrt{5}}{4}$, find QR , giving your answer in the form $c + d\sqrt{5}$, where c and d are integers. [4]

6 (a) Show that $\frac{\cot \theta + \tan \theta}{\sec \theta} = \operatorname{cosec} \theta$.

[4]



(b) Hence solve the equation $\left(\frac{\cot \frac{\phi}{3} + \tan \frac{\phi}{3}}{\sec \frac{\phi}{3}} \right)^2 = 2$, for $-540^\circ < \phi < 540^\circ$.

[6]

7 (a) A team of 8 people is to be chosen from a group of 15 people.



(i) Find the number of different teams that can be chosen.

[1]

(ii) Find the number of different teams that can be chosen if the group of 15 people contains a family of 4 people who must be kept together. [3]

(b) Given that $(n+9) \times {}^n P_{10} = (n^2 + 243) \times {}^{n-1} P_9$, find the value of n . [3]

8 A curve has the equation $y = \frac{(3x-4)^{\frac{1}{3}}}{2x+1}$.



(a) Show that $\frac{dy}{dx} = \frac{Ax+B}{(2x+1)^2(3x-4)^{\frac{2}{3}}}$, where A and B are integers to be found. [5]

(b) Find the coordinates of the stationary point on the curve. [2]

- 9 (a) The first three terms of an arithmetic progression are $\ln q$, $\ln q^4$ and $\ln q^7$, where q is a positive constant. The sum to n terms of this progression is $4845 \ln q$. Find the value of n . [3]

- (b) The first three terms of a geometric progression are p^{3x} , p^x and p^{-x} , where p is a positive integer. Find the n th term of this progression giving your answer in the form $p^{(a+bn)x}$. [3]

- (c) The first three terms of a different geometric progression are $\frac{4}{3}\cos^2 3\theta$, $\frac{16}{9}\cos^4 3\theta$ and $\frac{64}{27}\cos^6 3\theta$, for $0 < \theta < \frac{\pi}{3}$. Find the set of values of θ for which this progression has a sum to infinity. [5]

10 It is given that $y = (3x + 1)^2 \ln(3x + 1)$.



(a) Find $\frac{dy}{dx}$.

[3]

(b) Hence find $\int (3x + 1) \ln(3x + 1) dx$.

[4]