



Please write clearly in block capitals.

Centre number

--	--	--	--	--

Candidate number

--	--	--	--

Surname

Forename(s)

Candidate signature

I declare this is my own work.

AS MATHEMATICS

Paper 1

Thursday 15 May 2025

Afternoon

Time allowed: 1 hour 30 minutes

Materials

- You must have the AQA Formulae for A-level Mathematics booklet.
- You should have a graphical or scientific calculator that meets the requirements of the specification.

Instructions

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer each question in the space provided for that question.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do **not** write outside the box around each page or on blank pages.
- Show all necessary working; otherwise marks for method may be lost.
- Do all rough work in this book. Cross through any work that you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.

Advice

- Unless stated otherwise, you may quote formulae, without proof, from the booklet.
- You do not necessarily need to use all the space provided.

For Examiner's Use

Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
TOTAL	



J U N 2 5 7 3 5 6 1 0 1

G/LM/Jun25/G4006/V6

7356/1

Section AAnswer **all** questions in the spaces provided.

- 1** Identify the expression that is equivalent to $\tan x$

Circle your answer.

[1 mark]

$\sin^2 x + \cos^2 x$

$\sin^2 x - \cos^2 x$

$\frac{\cos x}{\sin x}$

$\frac{\sin x}{\cos x}$

- 2** Find the value of $\log_b \frac{1}{b^2}$

Circle your answer.

[1 mark]

-2

$-\frac{1}{2}$

$\frac{1}{2}$

2



3 The polynomial $p(x)$ is given by

$$p(x) = 2x^3 - ax^2 + 6x + 2a$$

It is given that $(x - 2)$ is a factor of $p(x)$

Find the value of a by using the factor theorem.

[3 marks]

Turn over for the next question

Turn over ►



4 Solve the equation

$$2\tan 3\theta - 3 = 0$$

for $0^\circ \leq \theta \leq 180^\circ$

Give your answers to the nearest degree.

[3 marks]

5 Jayven claims that for two real numbers a and b

if $a > b$, then it must be true that $\frac{a}{b} > 1$

By using a counter example, show that Jayven is **not** correct.

[2 marks]



6 It is given that $p = \log_2 x$ and $q = \log_2 y$

6 (a) Express

$$\log_2 \left(\frac{x^2}{y} \right)$$

in terms of p and q

[2 marks]

6 (b) Express

$$\log_2 (16x^3 \sqrt{y})$$

in terms of p and q

Give your answer in a form not involving logarithms.

[3 marks]

Turn over ►



7 A circle has equation

$$(x - a)^2 + (y - b)^2 = 49$$

7 (a) State the radius of the circle.

[1 mark]

7 (b) The circle crosses the x -axis at two distinct points.

Find the range of possible values for b

[2 marks]



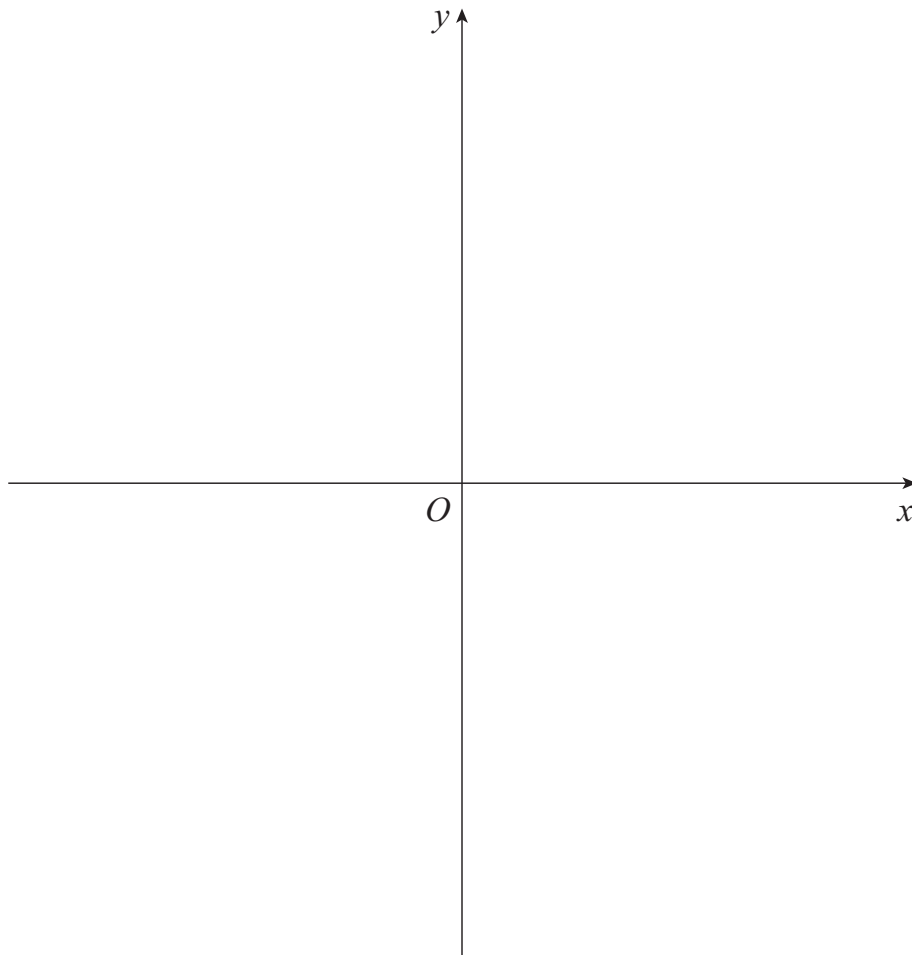
8 Sketch the graph of

$$y = (x - k)^2(x + 2k)$$

where k is a positive constant.

Label the coordinates of the points where the graph meets the axes.

[4 marks]



Turn over for the next question

Turn over ►



- 9 (a)** Find, in ascending powers of x , the first three terms in the expansion of

$$(1 - 5x)^7$$

[3 marks]



9 (b) The coefficient of x^2 in the expansion of

$$(3 + kx)(1 - 5x)^7$$

is 1477

Find the value of k

[3 marks]

Turn over for the next question

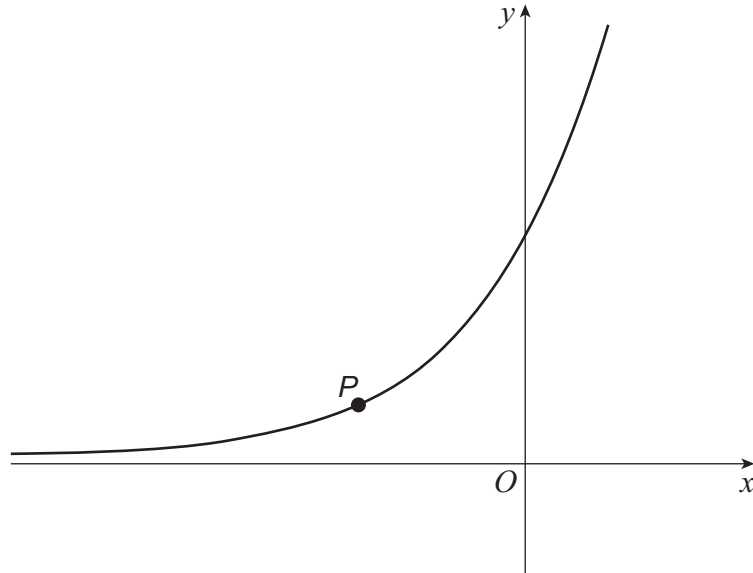
Turn over ►



10 A curve has the equation

$$y = e^{3x}$$

and the point P lies on the curve, as shown in the diagram.



The tangent to the curve at P is parallel to the line with equation $x - 9y = 23$

Find the x -coordinate of P

[5 marks]



Turn over for the next question

Turn over ►



There are no questions printed on this page

*Do not write
outside the
box*

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**



[1 mark]

$$\int_{-4}^2 x(x-2)(x+4) \, dx = 36$$

[4 marks]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

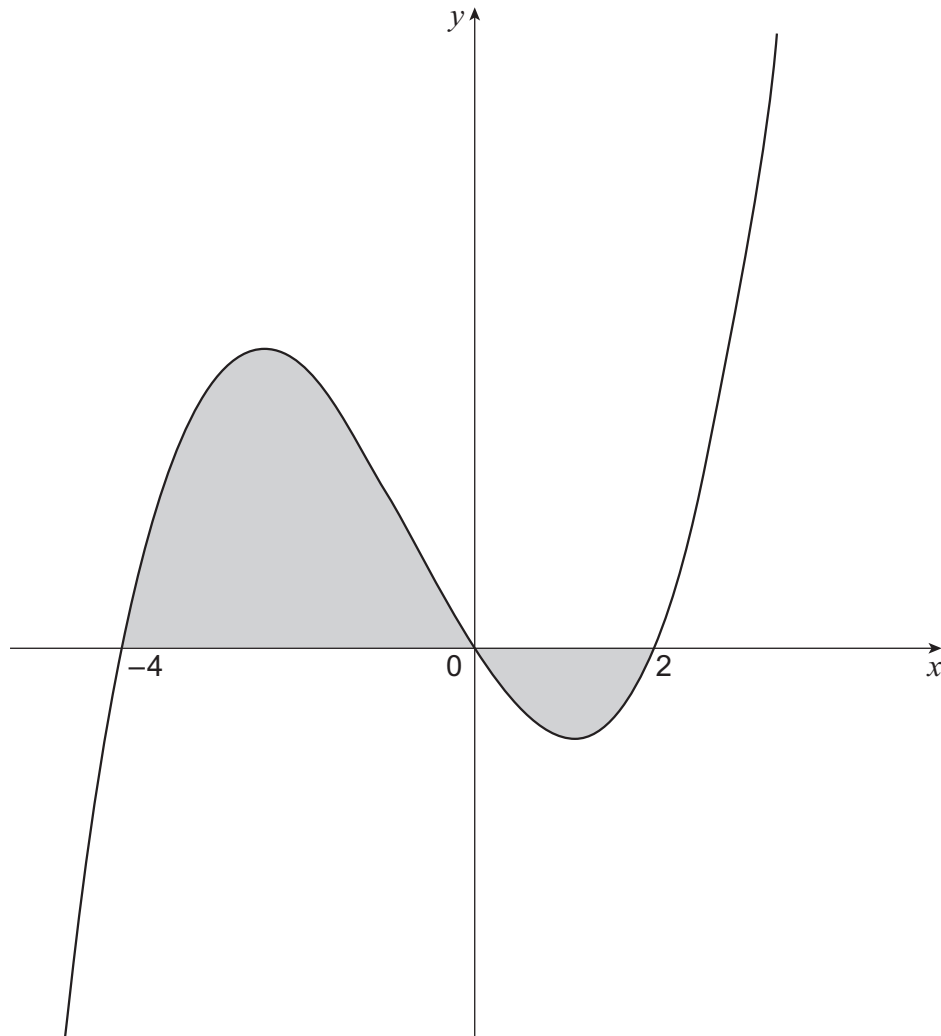
Turn over ►



- 11 (c)** The curve C has equation

$$y = x(x - 2)(x + 4)$$

A sketch of C is shown in the diagram.



- 11 (c) (i)** Explain why your answer to part **(b)** will not give the total area of the shaded region bounded by C and the x -axis.

[1 mark]



11 (c) (ii) Find the total area of the shaded region bounded by C and the x -axis.

[2 marks]

Turn over for the next question

Turn over ►



12 (a) It is given that

$${}^{40}C_{18} = \frac{40!}{18!p!}$$

Write down the value of p

[1 mark]

12 (b) Use the result from part (a) to show that

$$\frac{{}^{40}C_{18}}{{}^{40}C_{17}} = \frac{23}{q}$$

where q is an integer to be found.

[2 marks]



- 13** A computer game awards points to a player based on the time taken to complete a level.

The points awarded decrease as the time taken to complete a level increases.

Rebekah believes that the points awarded, P , can be modelled by the equation

$$P = Ae^{kt}$$

where t is the time, in seconds, taken to complete the level and A and k are constants.

- 13 (a)** Explain, in context, the meaning of the value of A

[1 mark]

- 13 (b)** Show that

$$\ln P = \ln A + kt$$

[2 marks]

Question 13 continues on the next page

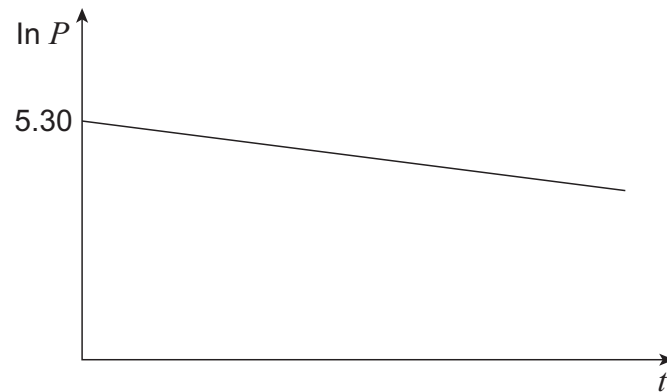
Turn over ►



- 13 (c)** Rebekah records the points and the time taken for her to complete each level.

She plots the values of $\ln P$ against t

Rebekah obtains a straight-line graph with a gradient of -0.08 and a vertical intercept of 5.30 , as shown in the diagram.



Find the value of A and the value of k

[3 marks]

13 (d) Rebekah scores 20 points for completing a particular level.

Find, to the nearest second, the time taken to complete this level.

[3 marks]

END OF SECTION A

Turn over for Section B

Turn over ►



Section B

Answer **all** questions in the spaces provided.

- 14** A particle of mass 2 kg is moving on a smooth horizontal surface under the action of a single horizontal force of 5 N

Find the acceleration of the particle.

Circle your answer.

[1 mark]

0.4 m s^{-2}

2.5 m s^{-2}

10 m s^{-2}

24.5 m s^{-2}



15 Three forces $\mathbf{F}_1$, $\mathbf{F}_2$ and $\mathbf{F}_3$ are given by:

$$\mathbf{F}_1 = (-2\mathbf{i} + 4\mathbf{j}) \text{ N}$$

$$\mathbf{F}_2 = (-3\mathbf{i} + 6\mathbf{j}) \text{ N}$$

$$\mathbf{F}_3 = (-6\mathbf{i} + 9\mathbf{j}) \text{ N}$$

One of the following statements is true.

Identify the correct statement.

Tick (✓) **one** box.

[1 mark]

$\mathbf{F}_1$ and $\mathbf{F}_2$ are parallel forces.

☐

$\mathbf{F}_1$ and $\mathbf{F}_3$ are parallel forces.

☐

$\mathbf{F}_2$ and $\mathbf{F}_3$ are parallel forces.

☐

None of the forces $\mathbf{F}_1$, $\mathbf{F}_2$ and $\mathbf{F}_3$ are parallel.

☐

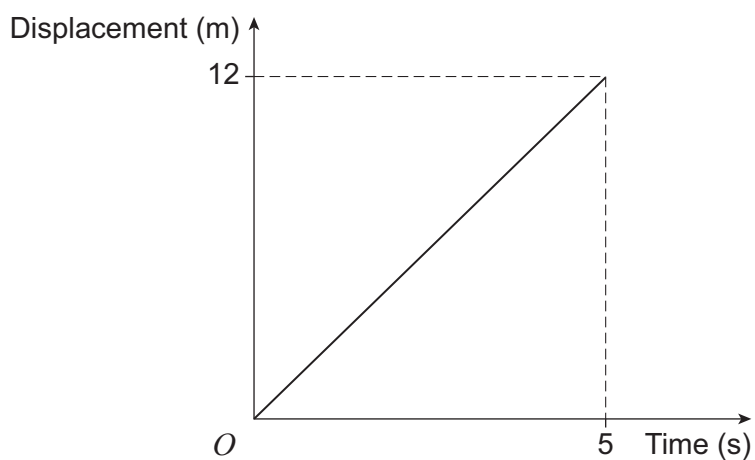
Turn over for the next question

Turn over ►



- 16** The displacement–time graph, **Figure 1**, shows the first 5 seconds of the motion of a car which starts from rest and travels 12 metres.

Figure 1



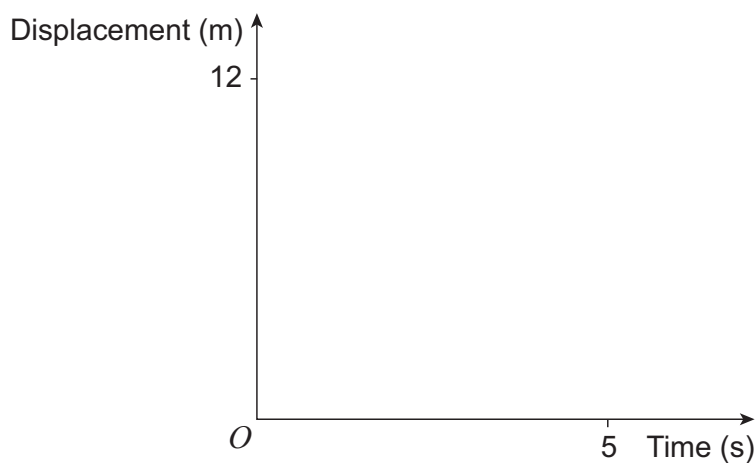
- 16 (a)** Find the speed of the car.

[1 mark]

- 16 (b)** On **Figure 2**, draw a more realistic displacement–time graph to show the first 5 seconds of motion of the car.

[1 mark]

Figure 2



17 In this question use $g = 9.8 \text{ m s}^{-2}$

Lamic has mass 60 kg.

He is standing on the floor of a lift.

The lift is accelerating upwards at 1.2 m s^{-2}

The reaction of the floor on Lamic is R newtons.

Find the value of R

[2 marks]

Turn over for the next question

Turn over ►



18 In this question use $g = 10 \text{ m s}^{-2}$

A ball is thrown vertically upwards from a height of 1.8 metres above the ground.

The initial velocity of the ball is 12 m s^{-1}

The greatest height reached by the ball above the ground is h metres.

Find the value of h

[3 marks]



19

A force $\mathbf{F}$ is $\begin{bmatrix} p \\ -0.5 \end{bmatrix}$ newtons, where p is a constant.

Given that the magnitude of $\mathbf{F}$ is 1.3 newtons, find the possible values of p

[3 marks]

Turn over for the next question

Turn over ►

20 A sports scientist is modelling the speed of an athlete who ran a 100-metre race.

The speed, $v \text{ m s}^{-1}$, of the athlete at time t seconds after the start of the 100-metre race is given by

$$v = 1.8 + 3.8t - 0.25t^2$$

20 (a) State the initial speed of the athlete according to the model.

[1 mark]

20 (b) (i) Find an expression, in terms of t , for the acceleration of the athlete.

[2 marks]

20 (b) (ii) Hence find the maximum speed of the athlete.

Fully justify your answer.

[4 marks]

20 (c) The official maximum speed recorded, by the scientist, for the athlete was 12.4 m s^{-1}

Evaluate the accuracy of the model used by the scientist.

[1 mark]

Turn over for the next question

Turn over ►

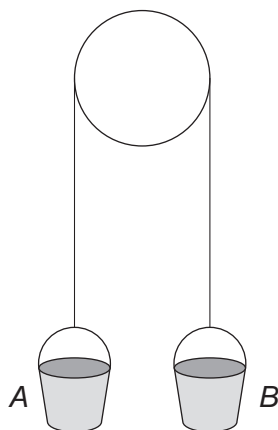


21 Two buckets, *A* and *B*, each have mass 0.5 kg

Each bucket is attached to one end of a light inextensible rope.

The rope is hung over a smooth fixed pulley.

The system is in equilibrium with both buckets hanging freely at rest, as shown in the diagram.



A builder then places a brick of mass 3 kg inside bucket *A*

Bucket *A*, with the brick inside, then moves vertically downwards.

During the subsequent motion, the magnitude of the acceleration of each bucket is $a \text{ m s}^{-2}$ and the magnitude of the tension in the rope is $T \text{ N}$

Assume the buckets and brick can be modelled as particles.

21 (a) Find a and T , leaving your answers in terms of g

Fully justify your answer.

[6 marks]



21 (b) Explain a limitation of modelling the buckets as particles.

[1 mark]

END OF QUESTIONS



There are no questions printed on this page

*Do not write
outside the
box*

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**



[illegible]

