

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

I declare this is my own work.

AS MATHEMATICS

Paper 1

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
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17	
TOTAL	



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

- 1** Express as a single logarithm

$$\log_{10} 2 - \log_{10} x$$

Circle your answer.

[1 mark]

$\log_{10} (2 + x)$

$\log_{10} (2 - x)$

$\log_{10} (2x)$

$\log_{10} \left(\frac{2}{x} \right)$

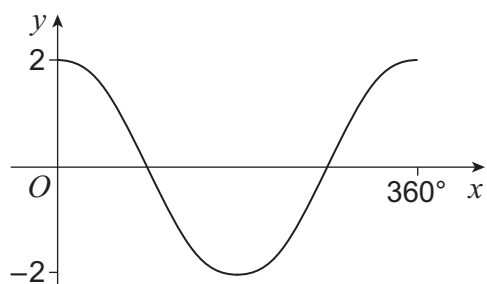
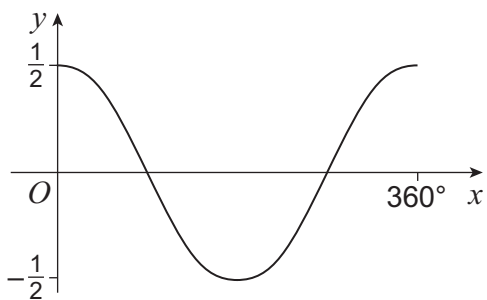
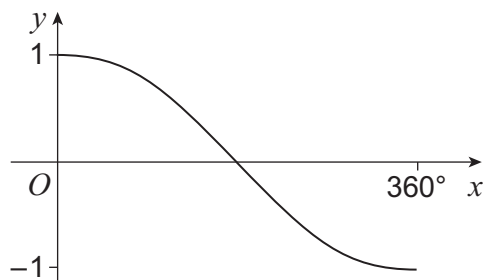
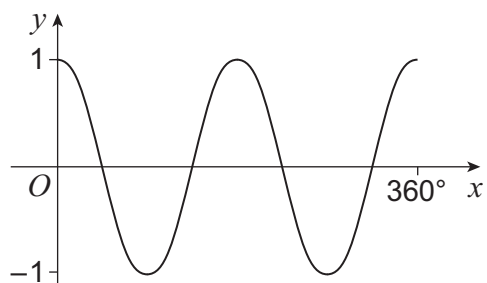


- 2 The graph of the function $y = \cos \frac{1}{2}x$ for $0^\circ \leq x \leq 360^\circ$ is one of the graphs shown below.

Identify the correct graph.

Tick (✓) **one** box.

[1 mark]


☐

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Turn over ►



Find the coefficient of the x^3 term in the expansion of $\left(3x + \frac{1}{2}\right)^4$

[illegible]

Find all the solutions of the equation

for $0^\circ < \theta < 360^\circ$, giving your answers to the nearest degree.

[5 marks]

[illegible]

Turn over ►



Express $3x^3 + 5x^2 - 27x + 10$ in the form $(x - 2)(ax^2 + bx + c)$, where a , b and c are integers.

[illegible]

Turn over for the next question

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ANSWER IN THE SPACES PROVIDED**

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[1 mark]

[4 marks]

[illegible]

[4 marks]

[illegible]

A curve has equation $y = a^2 - x^2$, where $a > 0$

Find the value of a .

Fully justify your answer.

[6 marks]

[illegible]

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8 A curve has equation

$$y = x^3 - 6x + \frac{9}{x}$$

8 (a) Show that the x coordinates of the stationary points of the curve satisfy the equation

$$x^4 - 2x^2 - 3 = 0$$

[3 marks]

8 (b) Deduce that the curve has exactly two stationary points.

[3 marks]



Fully justify your answer.

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[1 mark]

Turn over ►



Prove that $m^2 + n^2$ is a multiple of 2 but **not** a multiple of 4

[illegible]

Turn over for the next question

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10 (a) Find an equation of the tangent to C at the point $\left(2, \frac{\sqrt{2}}{4}\right)$

[illegible]

A Cartesian coordinate system showing the graph of the function $y = 2 - \sqrt{x}$ and its tangent line at the point $(2, \frac{\sqrt{2}}{4})$. The function is a curve that starts at the origin O and increases as x increases. The tangent line is a straight line that touches the curve at the point $(2, \frac{\sqrt{2}}{4})$ and has a negative slope. The x-axis and y-axis are labeled, and the origin is marked with O .

[illegible]

Turn over ►



Section B

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

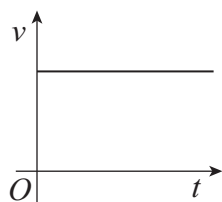
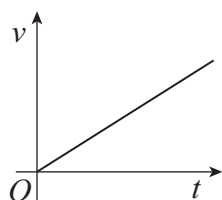
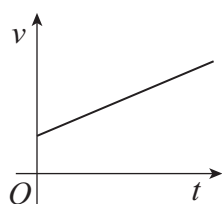
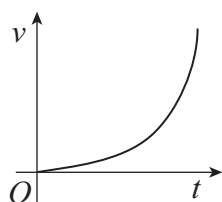
11

A car, initially at rest, moves with constant acceleration along a straight horizontal road.

One of the graphs below shows how the car's velocity, $v \text{ m s}^{-1}$, changes over time, t seconds.

Identify the correct graph.

Tick (✓) **one** box.

[1 mark]
☐

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- 12** A horizontal force of 30 N causes a crate to travel with an acceleration of 2 ms^{-2} , in a straight line, on a smooth horizontal surface.

Find the **weight** of the crate.

Circle your answer.

[1 mark]

15 kg

15g N

15 N

15g kg

- 13** Two points A and B lie in a horizontal plane and have coordinates $(-2, 7)$ and $(3, 19)$ respectively.

A particle moves in a straight line from A to B under the action of a constant resultant force of magnitude 6.5 N

Express the resultant force in vector form.

[3 marks]

Turn over ►



A ball is released from rest from a height h metres above horizontal ground and falls freely downwards.

Show that

[3 marks]

[illegible]

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A force of $\begin{bmatrix} 4 \\ 0 \end{bmatrix}$ N is applied to P .

[2 marks]

[illegible]

[3 marks]

[illegible]

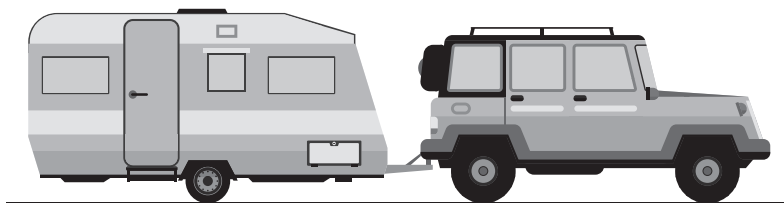
[4 marks]

[illegible]

[2 marks]

[illegible]

17



A car and caravan, connected by a tow bar, move forward together along a horizontal road.

Their velocity $v \text{ m s}^{-1}$ at time t seconds, for $0 \leq t < 20$, is given by

$$v = 0.5t + 0.01t^2$$

17 (a)

Show that when $t = 15$ their acceleration is 0.8 m s^{-2}

[2 marks]

17 (b)

The car has a mass of 1500 kg

The caravan has a mass of 850 kg

When $t = 15$ the tension in the tow bar is 800 N and the car experiences a resistance force of 100 N

17 (b) (i)

Find the total resistance force experienced by the caravan when $t = 15$

[2 marks]



17 (b) (ii) Find the driving force being applied by the car when $t = 15$

[3 marks]

17 (c) State one assumption you have made about the tow bar.

[1 mark]

END OF QUESTIONS



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