

Surname	
Other Names	
Candidate Signature	

Centre Number						Candidate Number				
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Examiner Comments	

Total Marks

MATHEMATICS

AS PAPER 1

CM

Bronze Set A (AQA Version)

Time allowed: 1 hour and 30 minutes

Instructions to candidates:

- In the boxes above, write your centre number, candidate number, your surname, other names and signature.
- Answer ALL of the questions.
- You must write your answer for each question in the spaces provided.
- You may use a calculator.

Information to candidates:

- Full marks may only be obtained for answers to ALL of the questions.
- The marks for individual questions and parts of the questions are shown in square brackets.
- There are 16 questions in this question paper. The total mark for this paper is 75.

Advice to candidates:

- You should ensure your answers to parts of the question are clearly labelled.
- You should show sufficient working to make your workings clear to the Examiner.
- Answers without working may not gain full credit.

AS/M/P1

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1 0 3 3 1 2 1 1 8 0 0 0 5



Section A

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

- 1 Find the derivative of $4x^3$.

Circle your answer.

[1 mark]

$$\frac{4}{3}x^2 \quad x^4 \quad 12x^2 \quad 16x^4$$

- 2 Here are two statements.

Statement A: x is even

Statement B: x is multiple of 6

Which of the following implications is true?

Circle your answer.

[1 mark]

$$A \Rightarrow B \quad A \Leftarrow B \quad A \Leftrightarrow B \quad \begin{array}{l} \text{there is} \\ \text{no connection} \\ \text{between A and B} \end{array}$$

- 3 Three of these lines are parallel.

Which **one** of these lines is not parallel to the rest?

Tick **one** box.

[1 mark]

$$2y - 3x = 4$$

$$-12x = 4(1 - 2y)$$

$$y - 5 = \frac{3}{2}(x - 1)$$

$$3(y - x) = 4 - y$$



4 (a) Find $\int (2x^2 - 5\sqrt{x} + 1)dx$, giving each term in its simplest form.

[4 marks]

4 (b) Hence, evaluate $\int_0^1 (2x^2 - 5\sqrt{x} + 1)dx$.

[2 marks]

Turn over ►



1 0 3 3 1 2 1 1 8 0 0 0 5

- 5 Figure 1 below shows the graph with equation $y = f(x)$.

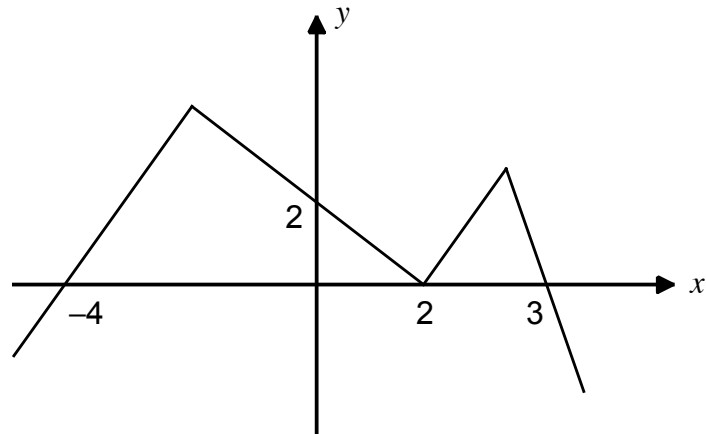


Figure 1

- 5 (a) In the space below, sketch the graph with equation $y = f(x - 4)$.

On your sketch, show clearly the coordinates of any points where the graph crosses intersects the coordinate axes.

[3 marks]



5 (b) In the space below, sketch the graph with equation $y = -2f(x)$.

On your sketch, show clearly the coordinates of any points where the graph crosses intersects the coordinate axes.

[3 marks]

Turn over ►



1 0 3 3 1 2 1 1 8 0 0 0 5

6 (a) The line l_1 has the equation $kx + (1 - k)y = 5$.

Find, in terms of k , an expression for the gradient of the line l_1 .

[2 marks]

6 (b) The line l_2 passes through the points $(1, 4)$ and $(3, k)$.

Find, in terms of k , an expression for the gradient of the line l_2 .

[1 mark]



6 (c) (i) Given that l_1 and l_2 are perpendicular, show that $k^2 - 2k - 2 = 0$.

[3 marks]

6 (c) (ii) Hence find the **exact** possible values of k .

[1 mark]

Turn over ►



7 (a) Prove that the function $f(x) = 3x^2 - 3x + 4$ is always positive.

[2 marks]

7 (b) Mark claims that: $2^n + 1 = 2^n + 2^n$.

Is Mark's claim always true, sometimes true or never true? Justify your answer.

[3 marks]



8 Given that

$$\frac{p+2\sqrt{3}}{\sqrt{3}-1} + \frac{p}{2\sqrt{3}} = q+5\sqrt{3}$$

find the values of p and q .

[7 marks]

Turn over ►



1 0 3 3 1 2 1 1 8 0 0 0 5

- 9 (a) In ascending powers of x , find the first three terms in the binomial expansion of

$$\left(3 - \frac{x}{5}\right)^8$$

giving each term in its simplest form.

[4 marks]



9 (b)

$$g(x) = (ax + b) \left(3 - \frac{x}{5} \right)^8$$

Given that the binomial expansion of $g(x)$ contains the terms 32805 and $-4374x$,
find the values of a and b .

[4 marks]

Turn over ►



1 0 3 3 1 2 1 1 8 0 0 0 5

10 (a) Prove that

$$\frac{\tan^2 x - 1}{\tan^2 x + 1} \equiv 1 - 2\cos^2 x$$

[3 marks]

10 (b) Hence, show that the equation

$$3\sin^2 \theta - \frac{\tan^2 \theta - 1}{\tan^2 \theta + 1} = 1$$

can be written in the form $\cos^2 \theta = k$, where k is a constant to be found.

[3 marks]



10 (b) [Question 10(b) continued]

10 (c) Solve, for $0 \leq \theta \leq 120^\circ$, the equation

$$3 \sin^2(3\theta) - \frac{\tan^2(3\theta) - 1}{\tan^2(3\theta) + 1} = 1$$

[2 marks]

END OF SECTION A
TURN OVER FOR SECTION B

Turn over ►



1 0 3 3 1 2 1 1 8 0 0 0 5

Section B

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

- 11** A particle of mass 2 kg moves on a rough horizontal surface due to a force of 10 N. The magnitude of the resistance to motion of the particle is 4 N.

Find the acceleration of the particle.

Circle your answer.

[1 mark]

3 m s⁻²

12 m s⁻²

6 m s⁻²

28 m s⁻²

- 12** A particle is projected vertically at 8 m s⁻¹ from a point that is 20 m above the ground.

Find the duration of time for which the particle is 22 m above the ground.

Circle your answer.

[1 mark]

1.3 s

0.3 s

1.0 s

1.6 s



13 At time $t = 0$, a particle passes the point A with velocity -4 m s^{-1} . The particle accelerates uniformly for 4 seconds until it is moving with a velocity 2 m s^{-1} . The particle then accelerates at a different uniform rate for 2 more seconds until it reaches a speed $V \text{ m s}^{-1}$. The particle maintains this speed for 4 seconds until it passes through the point B .

13 (a) Sketch a velocity-time graph for the motion of the particle between A and B .

[2 marks]

13 (b) Calculate the acceleration of the particle in the first 4 seconds of its motion.

[1 mark]

13 (c) Find the time at which the particle is at rest.

[2 marks]

Turn over ►



1 0 3 3 1 2 1 1 8 0 0 0 5

13 (d) Given that the total displacement of the particle between *A* and *B* is 13 m, find the value of *V*.

[3 marks]



14 The particle P moves in a straight line on the x -axis.
 At time t s, the velocity of the particle is v m s⁻¹, where

$$v = at^2 + b, \quad t \geq 0$$

and $a > 0$ and $b > 0$.

The initial velocity of the particle is 4 m s⁻².

The distance travelled by the particle in the third second of its motion is 61 m.

Find the values of a and b .

[4 marks]

Turn over ►



- 15** [In this question, \mathbf{i} and \mathbf{j} are perpendicular unit vectors directed due east and due north respectively.]

Starting from the point O at time $t = 0$, the boat B_1 moves with a constant velocity vector $(4\mathbf{i} - 6\mathbf{j}) \text{ m s}^{-1}$.

- 15 (a)** Find the speed of the boat B_1 .

[1 mark]

- 15 (b)** Find the bearing of the boat's path.

[2 marks]



The displacement, \mathbf{s} m, from the point O of another boat B_2 at time t seconds is given by $\mathbf{s} = 2\mathbf{i} + (3 - 4t)\mathbf{j}$.

- 15 (c)** Write down an expression for the displacement of B_1 from O at time t .

[1 mark]

- 15 (d)** Hence, show that the two boats do not meet.

[3 marks]



16

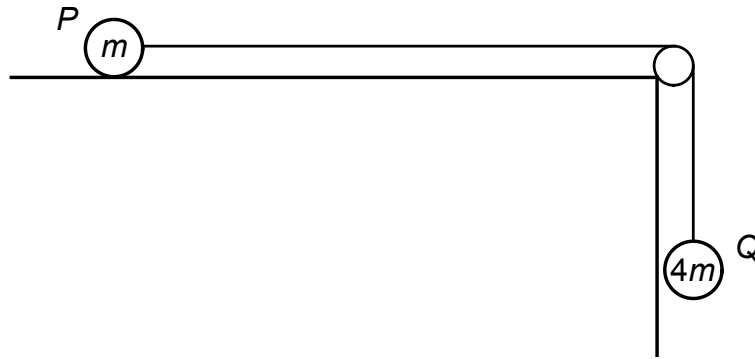


Figure 2

The particle P lies at rest on a rough horizontal table and is connected to one end of a light inextensible string. The light inextensible string passes over a small smooth pulley that is fixed to edge of the table. The other end of the string is attached to the particle Q , which hangs freely, as shown in **Figure 2** above.

The mass of P is m kg and the mass of Q is $4m$ kg.

The magnitude of the frictional force between P and the table is μR N, where μ is a constant and R is the magnitude of the normal contact force between P and the table.

The system is released from rest.

The magnitude of the acceleration of P is $0.7g$ m s⁻², where g is the acceleration due to gravity.

16 (a) Explain why the acceleration of Q is also $0.7g$ m s⁻².

[1 mark]



16 (b) Find the tension in the string

[2 marks]

16 (c) Find the value of μ .

[3 marks]

Question 16 continued on the next page



1 0 3 3 1 2 1 1 8 0 0 0 5

-
- 16 (d)** Calculate the magnitude and direction of the force exerted by the string on the pulley.

[3 marks]

END OF QUESTIONS

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