



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 2

Friday 23 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	
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TOTAL	



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

- 1** A curve C has equation

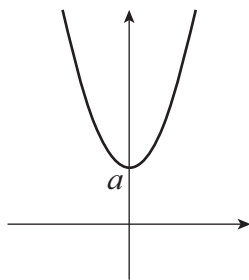
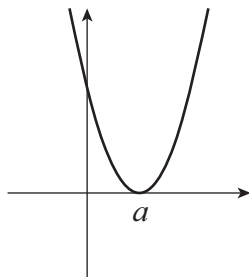
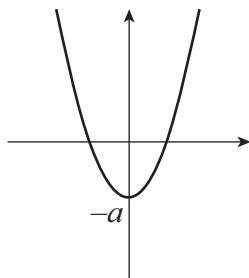
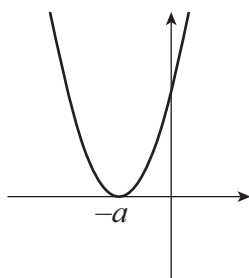
$$y = (x + a)^2$$

where a is a positive constant.

Identify which **one** of the graphs represents C

Tick (✓) **one** box.

[1 mark]


☐

☐

☐

☐

2 Given that

$$f'(x) = 3x^2$$

Find $f''(x)$

Circle your answer.

[1 mark]

6

$6x$

x^3

$1.5x^3$

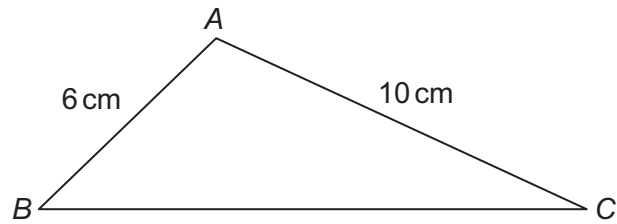
Turn over for the next question

Turn over ►



ABC is the cross-section of a triangular prism.

The length of AB is 6 cm and the length of AC is 10 cm as shown in the diagram.



The prism has length 20 cm and volume 500 cm^3

Find the size of the obtuse angle CAB

Give your answer to the nearest degree.

[4 marks]

[illegible]

4 The equation of the line L is

$$2x + 3y = 24$$

4 (a) Find the gradient of L

[1 mark]

4 (b) Point A has coordinates $(2, -2)$ and point B has coordinates $(10, p)$, where p is an integer.

The line L is the perpendicular bisector of the line AB

4 (b) (i) Find the value of p

[3 marks]

4 (b) (ii) Find the coordinates of the point of intersection of AB and L

[1 mark]

Turn over ►



$$u = 4^x$$

to solve the equation

$$16(4^{2x}) - 33(4^x) + 2 = 0$$

[4 marks]

[illegible]

[4 marks]

$$y = 2x^2 - 4x + 1$$

Fully justify your answer.

[illegible]

7 It is given that

$$f(x) = 3x^2 + 3x - 8$$

7 (a) Express $f(x)$ in the form

$$a(x + b)^2 + c$$

where a , b and c are constants to be found.

[3 marks]

7 (b) (i) State the minimum value of

$$3\sin^2\theta + 3\sin\theta - 8$$

[1 mark]



7 (b) (ii) Find the smallest positive value of θ for which this minimum value occurs.

[2 marks]

Turn over for the next question

Turn over ►



[8 marks]

Fully justify your answer.

[illegible]

9 It is given that

$$\int_1^3 f(x) dx = 8$$

9 (a) Write down the value of $\int_1^3 2f(x) dx$

[1 mark]

9 (b) Write down the value of $\int_1^3 (f(x) + 2) dx$

[1 mark]

9 (c) Write down the value of $\int_2^4 f(x - 1) dx$

[1 mark]

Turn over for the next question

Turn over ►



10 (a) Show that

$$\frac{1}{\sqrt{k} + \sqrt{k+1}} \equiv \sqrt{k+1} - \sqrt{k} \quad k > 0$$

[2 marks]

10 (b) Using the result from part (a) find the exact value of

$$\frac{1}{\sqrt{1} + \sqrt{2}} + \frac{1}{\sqrt{2} + \sqrt{3}} + \frac{1}{\sqrt{3} + \sqrt{4}}$$

Fully justify your answer.

[2 marks]

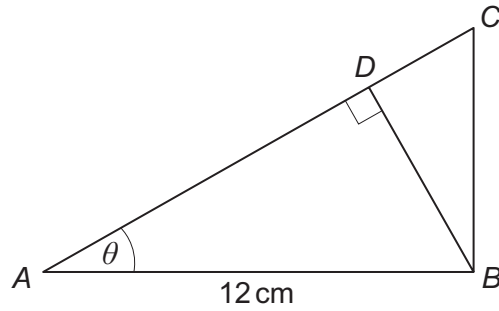


[4 marks]

[illegible]

12 In the triangle ABC , the length of $AB = 12$ cm and the angle ABC is a right angle.

The point D lies on AC such that BD is perpendicular to AC as shown in the diagram.



12 (a) Show that $AC = \frac{12}{\cos \theta}$

[1 mark]

12 (b) Write down an expression for AD in terms of $\cos \theta$

[1 mark]

12 (c) Hence show that $CD = \frac{12 - 12\cos^2 \theta}{\cos \theta}$

[2 marks]



[5 marks]

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Turn over for Section B

Turn over ►



Section B

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

13

The table shows the favourite sport of a group of students from years 12 and 13.

	football	rugby	netball	tennis	Total
Year 12	57	30	36	2	125
Year 13	33	11	19	12	75
Total	90	41	55	14	200

A student is chosen at random.

Find the probability that the student chosen is a year 12 student whose favourite sport is netball.

Circle your answer.

[1 mark]

0.18

0.275

0.288

0.44



14

The events A and B are independent.

It is given that $P(A) = 0.25$ and $P(B) = 0.6$

Find the value of $P(A \cap B)$

Circle your answer.

[1 mark]

0

0.15

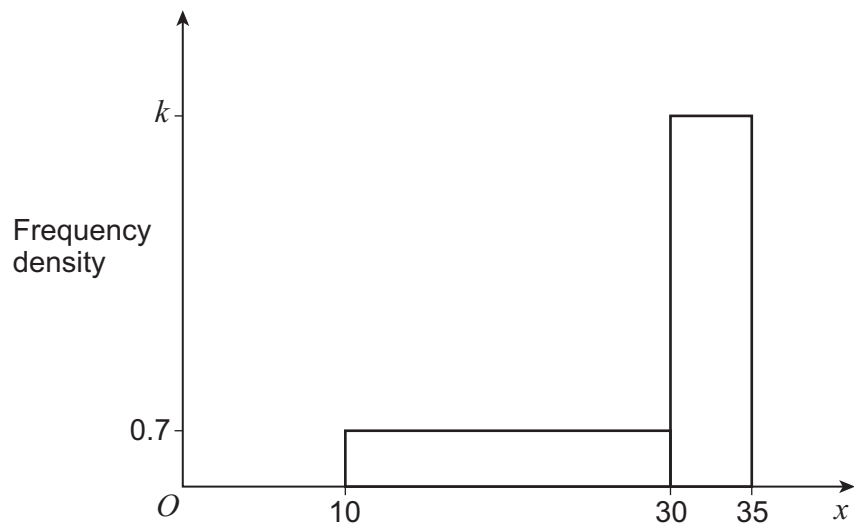
0.35

0.85

Turn over for the next question**Turn over ►**

15

The diagram shows part of a histogram illustrating the distribution of a variable x



The frequency density for the class $10 < x \leq 30$ is 0.7

The frequency density for the class $30 < x \leq 35$ is k

The frequency for the class $30 < x \leq 35$ is double the frequency for the class

$10 < x \leq 30$

Find the value of k

[2 marks]

16The table shows the probability distribution for a discrete random variable X

x	0	1	2	3	4
$P(X = x)$	$0.2 - p$	$0.05 + 3p$	$4p$	$2p$	$2p$

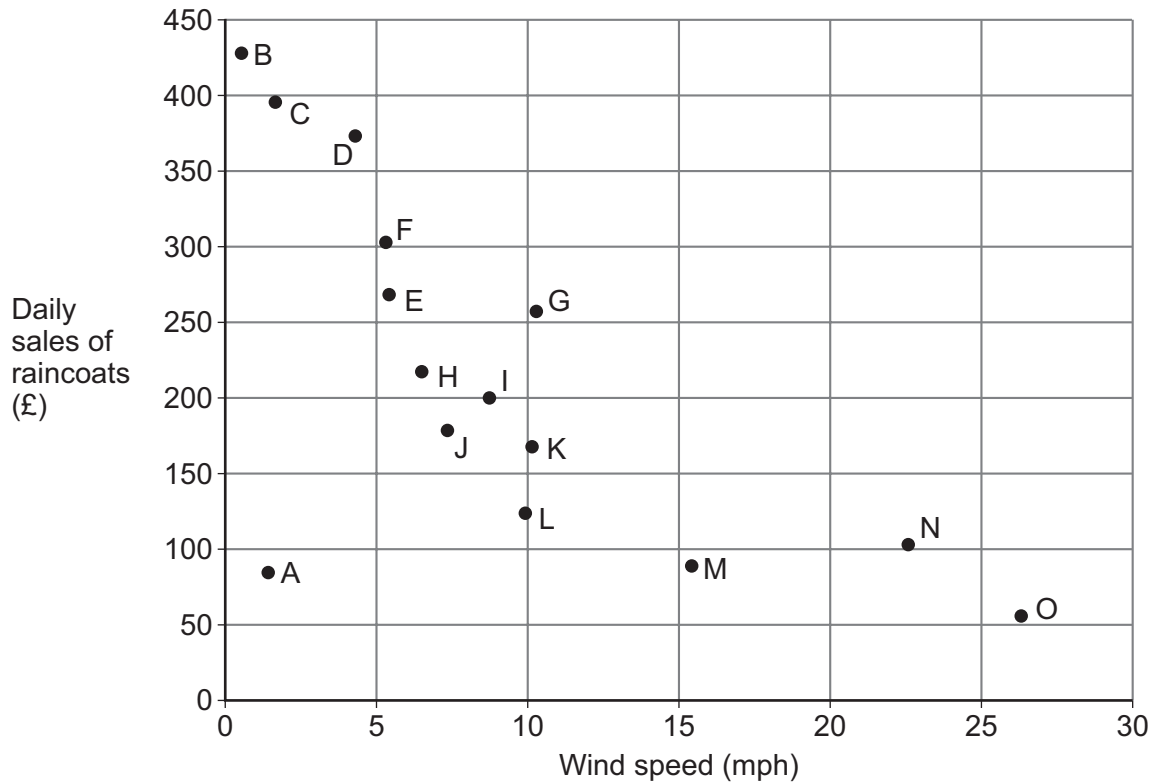
Find the value of the constant p **[2 marks]**

Turn over for the next question**Turn over ►**

17

The owner of a shop recorded the average daily wind speed in mph and the total sales of raincoats in pounds over a period of 6 months.

The data from a random selection of 15 days from the 6-month period is shown in the scatter diagram.



One of the points on the scatter diagram is an outlier.

17 (a)

State the letter from the diagram which corresponds to this outlier.

[1 mark]

17 (b)

State the effect on the numerical value of the correlation coefficient if the outlier was removed from the data.

[1 mark]



17 (c) Describe, in context, the correlation indicated by the scatter diagram.

[1 mark]

17 (d) The owner of the shop claims that the scatter diagram proves that windier days cause lower sales of raincoats.

Comment on the validity of this claim.

[1 mark]

Turn over for the next question

Turn over ►



18 It is known that 3% of the batteries sold in a supermarket are faulty.

Batteries are sold in packs of 12.

It can be assumed that the number of faulty batteries in a pack can be modelled by a binomial distribution.

18 (a) State **one** assumption, in context, necessary for the binomial distribution to be valid.

[1 mark]

18 (b) A pack of batteries is chosen at random.

Find the probability that exactly one battery in this pack is faulty.

[1 mark]

18 (c) A quality control supervisor tests 10 randomly chosen packs for faulty batteries.

Find the probability that at least two of the chosen packs have exactly one battery which is faulty.

[2 marks]



- 19** The table represents the frequency distribution of the CO₂ emissions, x g/km of all of the electric and electric/petrol BMW cars in the Large Data Set that were registered in the South-West in 2016.

x	0	13	45	49	77	78
Frequency	1	2	3	9	2	2

- 19 (a)** State the number of electric cars in the distribution.

[1 mark]

- 19 (b)** Find the mean of the CO₂ emissions.

[1 mark]

- 19 (c)** Find the standard deviation of the CO₂ emissions.

[1 mark]

- 19 (d)** Explain why it is **not** valid to compare the results from part (b) and part (c) with the mean and standard deviation of the CO₂ emissions of the electric and electric/petrol BMW cars in the Large Data Set that were registered in the South-West in **2002**.

[1 mark]

Turn over ►



20 An office worker has to pass through four sets of traffic lights when driving to work.

If a set of lights is red, the driver has to stop.

The probability that each set of lights is red when the office worker arrives at them is given by

$$P(\text{set 1 is red}) = 0.54$$

$$P(\text{set 2 is red}) = 0.6$$

$$P(\text{set 3 is red}) = 0.7$$

$$P(\text{set 4 is red}) = 0.8$$

Assume that the event that a light is red is independent of whether the other lights are red.

20 (a) Find the probability that the office worker is stopped at all four sets of lights.

[1 mark]

20 (b) Find the probability that the office worker is stopped at **exactly one** of the four sets of lights.

[3 marks]



[illegible]

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ANSWER IN THE SPACES PROVIDED**



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Question number	Additional page, if required. Write the question numbers in the left-hand margin.
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