



# Cambridge International AS & A Level

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## MATHEMATICS

9709/53

Paper 5 Probability &amp; Statistics 1

May/June 2026

1 hour 15 minutes

You must answer on the question paper.

You will need: List of formulae (MF19)

### 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. Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- If additional space is needed, you should use the lined page at the end of this booklet; the question number or numbers must be clearly shown.
- 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 50.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages.



1 A fair 8-sided dice with faces labelled 1, 2, 3, 4, 5, 6, 7, 8 is thrown repeatedly.

(a) Find the probability that a 5 will be obtained for the first time on the 7th throw. [1]

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**(b)** Find the probability that a 5 will be obtained for the first time before the 10th throw. [2]

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(c) Find the probability that a 5 will be obtained at least once but no more than three times in 12 randomly chosen throws. [3]

[illegible]

2 The random variable  $X$  takes the values  $-2, 0, 1, 3$ . It is given that  $P(X = x) = k(x + 1)^2$ , where  $k$  is a constant.

(a) Draw up the probability distribution table for  $X$ , giving the probabilities as numerical fractions **not** involving  $k$ . [3]

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(b) Find the value of  $\text{Var}(X)$ . [3]

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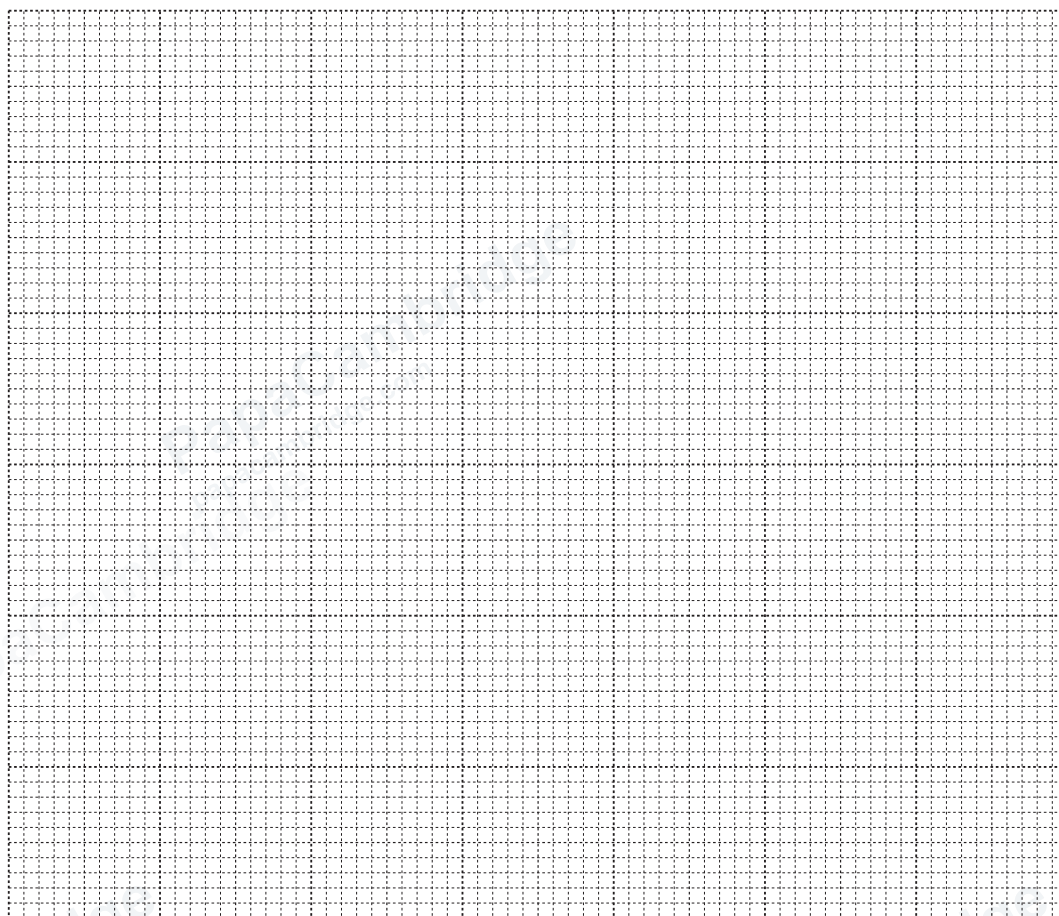


- 3 The times taken, in minutes, by 150 students to complete a particular computer game are summarised in the table.

| time taken<br>( $t$ minutes) | $0 \leq t < 10$ | $10 \leq t < 15$ | $15 \leq t < 20$ | $20 \leq t < 25$ | $25 \leq t < 35$ | $35 \leq t < 60$ |
|------------------------------|-----------------|------------------|------------------|------------------|------------------|------------------|
| frequency                    | 4               | 24               | 40               | 46               | 26               | 10               |

- (a) Draw a histogram to represent this information.

[4]



(b) Calculate an estimate for the mean of these times.

[3]

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(c) In which class interval does the 40th percentile of the times lie?

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- 4 Eber has a coin which is biased so that the probability of obtaining a head is  $\frac{1}{4}$ . She also has two bags containing coloured discs. Bag  $A$  contains 5 red discs and 3 blue discs. Bag  $B$  contains 4 red discs and 5 green discs.

Eber tosses her coin. If she obtains a head, she chooses two discs from bag  $A$ , at random, one at a time and without replacement. If she obtains a tail, she chooses two discs from bag  $B$ , at random, one at a time and without replacement.

- (a) Draw a fully labelled tree diagram to represent this information.

[2]



(b) Find the probability that Ebere obtains two discs of the same colour.

[3]

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(c) Find the probability that Ebere obtained a head with her coin given that at least one of the discs is red.

[4]

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5 The lengths of Indian cobra snakes are normally distributed with mean 125 cm and standard deviation 8 cm.

- (a) Find the probability that a randomly chosen Indian cobra has a length between 105 cm and 135 cm.

[3]

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The masses of Indian cobras are normally distributed with mean 2.5 kg and standard deviation  $\sigma$  kg. It is known that 81% of Indian cobras have a mass less than 2.7 kg.

- (b) Find the value of  $\sigma$ .

[3]

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A random sample of 80 Indian cobras is taken.

- (c) Use an approximation to find the probability that fewer than 60 of these 80 Indian cobras have a mass less than 2.7 kg. [5]

This image shows a full page of blank handwriting practice paper. It features multiple rows of horizontal lines. Each row consists of a solid top line, a dashed middle line, and a solid bottom line, providing a guide for letter height and placement. The paper is white, and the lines are light gray or blue. There are faint, diagonal watermarks across the page that read "PapaCambridge.com".



- 6 (a) Find the number of different arrangements of the 10 letters in the word POSSESSION in which the four Ss are all next to each other and the two Os are **not** next to each other. [3]

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- (b) Find the number of different arrangements of the 10 letters in the word POSSESSION in which the P is at the beginning, the N is at the end and there are exactly four letters between the two Os. [3]

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Five letters are selected from the 10 letters in the word POSSESSION.

- (c) Find the number of different selections in which the five letters include at least two Ss and at least one O. [4]

This image shows a full page of primary-ruled paper. It features multiple sets of horizontal dotted lines, each set separated by a larger gap. A diagonal dashed line runs from the top-left towards the bottom-right, bisecting each section between the horizontal lines. The entire page is covered by a faint, repeating watermark that reads "PapaCambridge" followed by "papacambridge.com".



## Additional page

If you use the following page to complete the answer to any question, the question number must be clearly shown.

[illegible]

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