Cambridge Assessment International Education

# Cambridge International AS & A Level

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*0009309270*

**MATHEMATICS** **9709/52**

Paper 5 Probability & Statistics 1 **May/June 2021**

**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 or correction fluid.
- 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.


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**1** An ordinary fair die is thrown repeatedly until a 5 is obtained. The number of throws taken is denoted by the random variable $X$.

**(a)** Write down the mean of $X$. [1]

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**(b)** Find the probability that a 5 is first obtained after the 3rd throw but before the 8th throw. [2]

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**(c)** Find the probability that a 5 is first obtained in fewer than 10 throws. [2]

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**2** The weights of bags of sugar are normally distributed with mean 1.04 kg and standard deviation $\sigma$ kg. In a random sample of 2000 bags of sugar, 72 weighed more than 1.10 kg.

Find the value of $\sigma$. [4]

**3** On each day that Alexa goes to work, the probabilities that she travels by bus, by train or by car are 0.4, 0.35 and 0.25 respectively. When she travels by bus, the probability that she arrives late is 0.55. When she travels by train, the probability that she arrives late is 0.7. When she travels by car, the probability that she arrives late is $x$.

On a randomly chosen day when Alexa goes to work, the probability that she does not arrive late is 0.48.

**(a)** Find the value of $x$. [3]

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**(b)** Find the probability that Alexa travels to work by train given that she arrives late. [3]

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**4** A fair spinner has sides numbered 1, 2, 2. Another fair spinner has sides numbered −2, 0, 1. Each spinner is spun. The number on the side on which a spinner comes to rest is noted. The random variable $X$ is the sum of the numbers for the two spinners.

**(a)** Draw up the probability distribution table for $X$. [3]

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**(b)** Find $\mathrm{E}(X)$ and $\mathrm{Var}(X)$. [3]

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**5** Every day Richard takes a flight between Astan and Bejin. On any day, the probability that the flight arrives early is 0.15, the probability that it arrives on time is 0.55 and the probability that it arrives late is 0.3.

**(a)** Find the probability that on each of 3 randomly chosen days, Richard's flight does not arrive late. [1]

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**(b)** Find the probability that for 9 randomly chosen days, Richard's flight arrives early at least 3 times. [3]

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**(c)** 60 days are chosen at random.

Use an approximation to find the probability that Richard's flight arrives early at least 12 times. [5]

**6** **(a)** Find the total number of different arrangements of the 8 letters in the word TOMORROW. [2]

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**(b)** Find the total number of different arrangements of the 8 letters in the word TOMORROW that have an R at the beginning and an R at the end, and in which the three Os are not all together. [3]

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Four letters are selected at random from the 8 letters of the word TOMORROW.

**(c)** Find the probability that the selection contains at least one O and at least one R. [5]

**7** The heights, in cm, of the 11 basketball players in each of two clubs, the Amazons and the Giants, are shown below.

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Amazons | 205 | 198 | 181 | 182 | 190 | 215 | 201 | 178 | 202 | 196 | 184 |
| Giants | 175 | 182 | 184 | 187 | 189 | 192 | 193 | 195 | 195 | 195 | 204 |

**(a)** State an advantage of using a stem-and-leaf diagram compared to a box-and-whisker plot to illustrate this information. [1]

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**(b)** Represent the data by drawing a back-to-back stem-and-leaf diagram with Amazons on the left-hand side of the diagram. [4]

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**(c)** Find the interquartile range of the heights of the players in the Amazons. [2]

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Four new players join the Amazons. The mean height of the 15 players in the Amazons is now 191.2 cm. The heights of three of the new players are 180 cm, 185 cm and 190 cm.

**(d)** Find the height of the fourth new player. [3]

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## Additional Page

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