

Cambridge International AS & A Level

CANDIDATE
NAME

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MATHEMATICS

9709/51

Paper 5 Probability & Statistics 1

May/June 2020

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 **16** pages. Blank pages are indicated.

1 The score when two fair six-sided dice are thrown is the sum of the two numbers on the upper faces.

(a) Show that the probability that the score is 4 is $\frac{1}{12}$. [1]

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The two dice are thrown repeatedly until a score of 4 is obtained. The number of throws taken is denoted by the random variable X .

(b) Find the mean of X . [1]

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(c) Find the probability that a score of 4 is first obtained on the 6th throw. [1]

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(d) Find $P(X < 8)$. [2]

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- 2 (a) Find the number of different arrangements that can be made from the 9 letters of the word JEWELLERY in which the three Es are together and the two Ls are together. [2]

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- (b) Find the number of different arrangements that can be made from the 9 letters of the word JEWELLERY in which the two Ls are not next to each other. [4]

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- 3 A company produces small boxes of sweets that contain 5 jellies and 3 chocolates. Jemeel chooses 3 sweets at random from a box.

- (a)** Draw up the probability distribution table for the number of jellies that Jemeel chooses. [4]

[illegible]

The company also produces large boxes of sweets. For any large box, the probability that it contains more jellies than chocolates is 0.64. 10 large boxes are chosen at random.

- (b)** Find the probability that no more than 7 of these boxes contain more jellies than chocolates. [3]

[illegible]

- 4 In a music competition, there are 8 pianists, 4 guitarists and 6 violinists. 7 of these musicians will be selected to go through to the final.

How many different selections of 7 finalists can be made if there must be at least 2 pianists, at least 1 guitarist and more violinists than guitarists? [4]

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- 5 On Mondays, Rani cooks her evening meal. She has a pizza, a burger or a curry with probabilities 0.35, 0.44, 0.21 respectively. When she cooks a pizza, Rani has some fruit with probability 0.3. When she cooks a burger, she has some fruit with probability 0.8. When she cooks a curry, she never has any fruit.

(a) Draw a fully labelled tree diagram to represent this information. [2]

(b) Find the probability that Rani has some fruit.

[2]

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(c) Find the probability that Rani does not have a burger given that she does not have any fruit. [4]

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- 6** The lengths of female snakes of a particular species are normally distributed with mean 54 cm and standard deviation 6.1 cm.
- (a)** Find the probability that a randomly chosen female snake of this species has length between 50 cm and 60 cm. [4]

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

The lengths of male snakes of this species also have a normal distribution. A scientist measures the lengths of a random sample of 200 male snakes of this species. He finds that 32 have lengths less than 45 cm and 17 have lengths more than 56 cm.

- (b)** Find estimates for the mean and standard deviation of the lengths of male snakes of this species. [5]

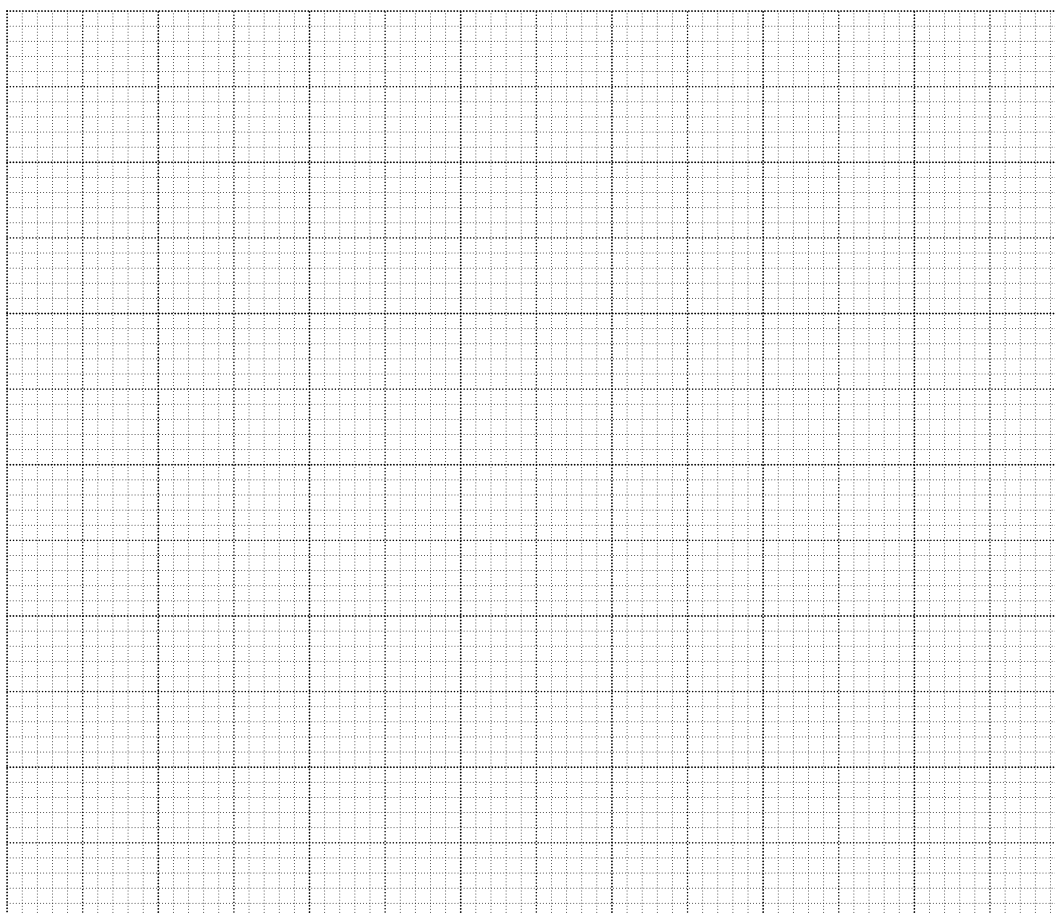
[illegible]

- 7 The numbers of chocolate bars sold per day in a cinema over a period of 100 days are summarised in the following table.

Number of chocolate bars sold	1 – 10	11 – 15	16 – 30	31 – 50	51 – 60
Number of days	18	24	30	20	8

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

[5]



- (b) What is the greatest possible value of the interquartile range for the data? [2]

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- (c) Calculate estimates of the mean and standard deviation of the number of chocolate bars sold. [4]

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