



Cambridge International AS & A Level

CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--

* 1 7 1 3 0 5 9 3 5 1 *

MATHEMATICS

9709/51

Paper 5 Probability & Statistics 1

October/November 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 **12** pages. Blank pages are indicated.

1 Two ordinary fair dice, one red and the other blue, are thrown.

Event A is 'the score on the red die is divisible by 3'.

Event B is 'the sum of the two scores is at least 9'.

(a) Find $P(A \cap B)$.

[2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Hence determine whether or not the events A and B are independent.

[2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- 2 The probability that a student at a large music college plays in the band is 0.6. For a student who plays in the band, the probability that she also sings in the choir is 0.3. For a student who does not play in the band, the probability that she sings in the choir is x . The probability that a randomly chosen student from the college does not sing in the choir is 0.58.

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

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Two students from the college are chosen at random.

(b) Find the probability that both students play in the band and both sing in the choir. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

3 Kayla is competing in a throwing event. A throw is counted as a success if the distance achieved is greater than 30 metres. The probability that Kayla will achieve a success on any throw is 0.25.

(a) Find the probability that Kayla takes more than 6 throws to achieve a success. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Find the probability that, for a random sample of 10 throws, Kayla achieves at least 3 successes. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

6

5 The time in hours that Davin plays on his games machine each day is normally distributed with mean 3.5 and standard deviation 0.9.

- (a) Find the probability that on a randomly chosen day Davin plays on his games machine for more than 4.2 hours. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (b) On 90% of days Davin plays on his games machine for more than t hours. Find the value of t . [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

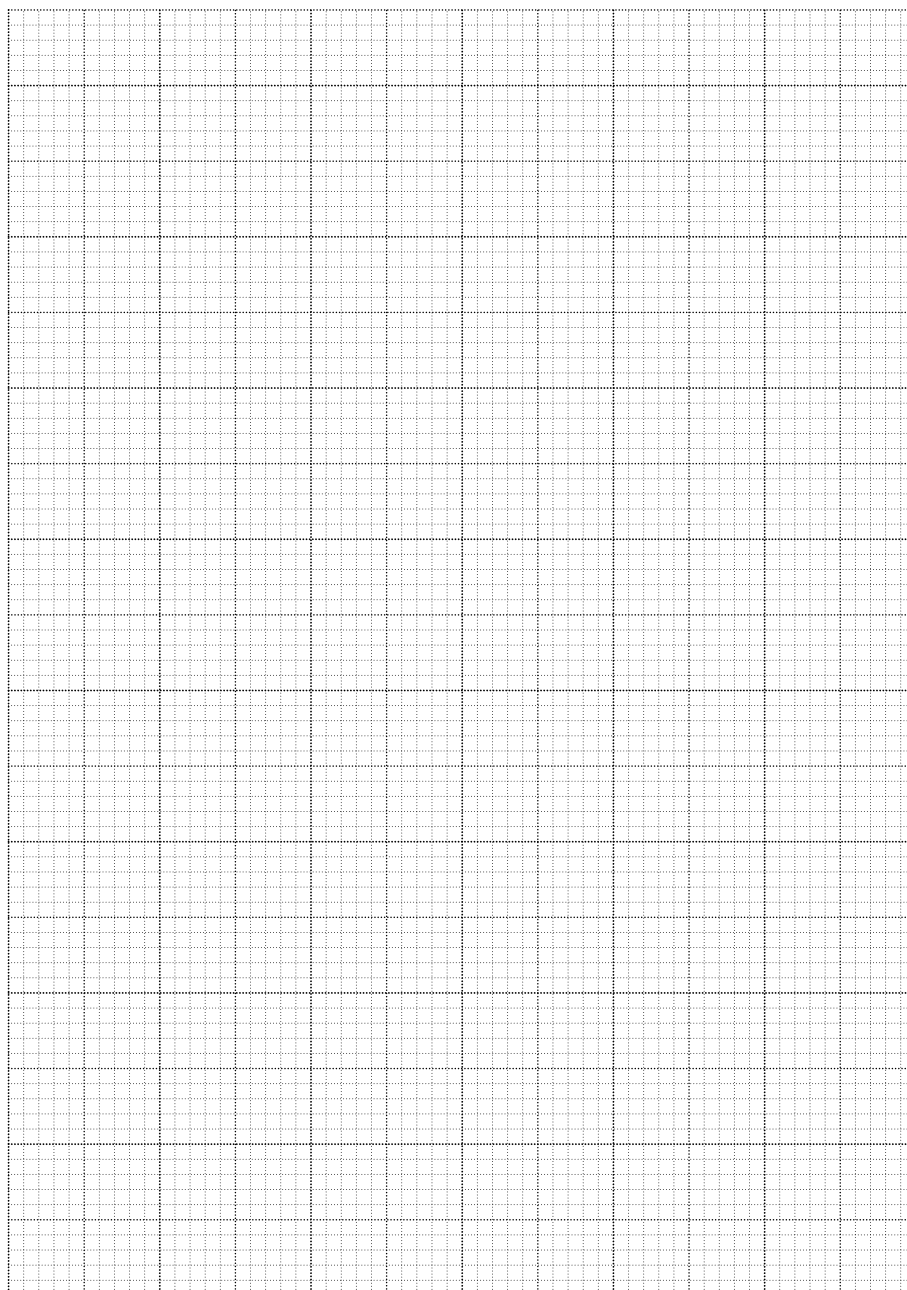
.....

- 6 The times, t minutes, taken by 150 students to complete a particular challenge are summarised in the following cumulative frequency table.

Time taken (t minutes)	$t \leq 20$	$t \leq 30$	$t \leq 40$	$t \leq 60$	$t \leq 100$
Cumulative frequency	12	48	106	134	150

- (a) Draw a cumulative frequency graph to illustrate the data.

[2]



(b) 24% of the students take k minutes or longer to complete the challenge. Use your graph to estimate the value of k . [2]

.....

.....

.....

.....

.....

(c) Calculate estimates of the mean and the standard deviation of the time taken to complete the challenge. [6]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- 7 (a) Find the number of different ways in which the 10 letters of the word SHOPKEEPER can be arranged so that all 3 Es are together. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (b) Find the number of different ways in which the 10 letters of the word SHOPKEEPER can be arranged so that the Ps are not next to each other. [4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (c) Find the probability that a randomly chosen arrangement of the 10 letters of the word SHOPKEEPER has an E at the beginning and an E at the end. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Four letters are selected from the 10 letters of the word SHOPKEEPER.

- (d) Find the number of different selections if the four letters include exactly one P. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

