



## Cambridge International AS & A Level

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**MATHEMATICS**

**9709/63**

Paper 6 Probability & Statistics 2

**October/November 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 **16** pages. Any blank pages are indicated.

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4 A random variable  $X$  has probability density function given by

$$f(x) = \begin{cases} \frac{1}{18}(9 - x^2) & 0 \leq x \leq 3, \\ 0 & \text{otherwise.} \end{cases}$$

(a) Find  $P(X < 1.2)$ . [3]

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(b) Find  $E(X)$ . [3]

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5 (a) The proportion of people having a particular medical condition is 1 in 100 000. A random sample of 2500 people is obtained. The number of people in the sample having the condition is denoted by  $X$ .

(i) State, with a justification, a suitable approximating distribution for  $X$ , giving the values of any parameters. [2]

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(ii) Use the approximating distribution to calculate  $P(X > 0)$ . [2]

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- 6 The random variable  $T$  denotes the time, in seconds, for 100 m races run by Tania.  $T$  is normally distributed with mean  $\mu$  and variance  $\sigma^2$ . A random sample of 40 races run by Tania gave the following results.

$$n = 40 \quad \Sigma t = 560 \quad \Sigma t^2 = 7850$$

- (a) Calculate unbiased estimates of  $\mu$  and  $\sigma^2$ . [3]

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The random variable  $S$  denotes the time, in seconds, for 100 m races run by Suki.  $S$  has the independent distribution  $N(14.2, 0.3)$ .

- (b) Using your answers to part (a), find the probability that, in a randomly chosen 100 m race, Suki's time will be at least 0.1 s more than Tania's time. [5]

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**Additional Page**

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