

Cambridge International AS & A Level

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MATHEMATICS**9709/62**

Paper 6 Probability & Statistics 2

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 **12** pages. Blank pages are indicated.

- 1 The masses, in grams, of plums of a certain type have the distribution $N(40.4, 5.2^2)$. The plums are packed in bags, with each bag containing 6 randomly chosen plums. If the total weight of the plums in a bag is less than 220 g the bag is rejected.

Find the percentage of bags that are rejected.

[4]

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2 A shop obtains apples from a certain farm. It has been found that 5% of apples from this farm are Grade A. Following a change in growing conditions at the farm, the shop management plan to carry out a hypothesis test to find out whether the proportion of Grade A apples has increased. They select 25 apples at random. If the number of Grade A apples is more than 3 they will conclude that the proportion has increased.

(a) State suitable null and alternative hypotheses for the test. [1]

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(b) Find the probability of a Type I error. [3]

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In fact 2 of the 25 apples were Grade A.

(c) Which of the errors, Type I or Type II, is possible? Justify your answer. [2]

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3 In the data-entry department of a certain firm, it is known that 0.12% of data items are entered incorrectly, and that these errors occur randomly and independently.

(a) A random sample of 3600 data items is chosen. The number of these data items that are incorrectly entered is denoted by X .

(i) State the distribution of X , including the values of any parameters. [1]

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(ii) State an appropriate approximating distribution for X , including the values of any parameters.

Justify your choice of approximating distribution. [3]

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(iii) Use your approximating distribution to find $P(X > 2)$. [2]

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- 4 The score on one spin of a 5-sided spinner is denoted by the random variable X with probability distribution as shown in the table.

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| x | 0 | 1 | 2 | 3 | 4 |
| $P(X = x)$ | 0.1 | 0.2 | 0.4 | 0.2 | 0.1 |

- (a) Show that $\text{Var}(X) = 1.2$. [2]

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The spinner is spun 200 times. The score on each spin is noted and the mean, \bar{X} , of the 200 scores is found.

- (b) Given that $P(\bar{X} > a) = 0.1$, find the value of a . [4]

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5 (a) The random variable X has the distribution $Po(\lambda)$.

(i) State the values that X can take.

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It is given that $P(X = 1) = 3 \times P(X = 0)$.

(ii) Find λ .

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(iii) Find $P(4 \leq X \leq 6)$.

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6 A random variable X has probability density function given by

$$f(x) = \begin{cases} \frac{k}{x^2} & 1 \leq x \leq a, \\ 0 & \text{otherwise,} \end{cases}$$

where k and a are positive constants.

(a) Show that $k = \frac{a}{a-1}$. [3]

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(b) Find $E(X)$ in terms of a . [3]

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(c) Find the 60th percentile of X in terms of a . [4]

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