Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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3831026276

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.

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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]

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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(b) Another large random sample of n data items is chosen. The probability that the sample contains no data items that are entered incorrectly is more than 0.1.

Use an approximating distribution to find the largest possible value of n. [3]

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.

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, $\overline{X}$, of the 200 scores is found.

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

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(c) Explain whether it was necessary to use the Central Limit theorem in your answer to part **(b)**. [1]

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(d) Johann has another, similar, spinner. He suspects that it is biased so that the mean score is less than 2. He spins his spinner 200 times and finds that the mean of the 200 scores is 1.86.

Given that the variance of the score on one spin of this spinner is also 1.2, test Johann's suspicion at the 5% significance level. [5]

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

(i) State the values that X can take. [1]

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

(ii) Find λ. [1]

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(iii) Find $\text{P}(4 \leqslant X \leqslant 6)$. [2]

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(b) The random variable Y has the distribution $\text{Po}(\mu)$ where μ is large. Using a suitable approximating distribution, it is found that $\text{P}(Y < 46) = 0.0668$, correct to 4 decimal places.

Find μ. [5]

6 A random variable X has probability density function given by

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

where k and a are positive constants.

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

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(b) Find $\mathrm{E}(X)$ 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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Additional Page

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