

Cambridge International AS & A Level

CANDIDATE
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MATHEMATICS

9709/61

Paper 6 Probability & Statistics 2

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 [].

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- 1** It is known that, on average, 1 in 300 flowers of a certain kind are white. A random sample of 200 flowers of this kind is selected.

- (a)** Use an appropriate approximating distribution to find the probability that more than 1 flower in the sample is white. [3]

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- (b)** Justify the approximating distribution used in part **(a)**. [1]

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The probability that a randomly chosen flower of another kind is white is 0.02. A random sample of 150 of these flowers is selected.

- (c)** Use an appropriate approximating distribution to find the probability that the total number of white flowers in the two samples is less than 4. [3]

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- 2 In a survey, a random sample of 250 adults in Fromleigh were asked to fill in a questionnaire about their travel.
- (a) It was found that 102 adults in the sample travel by bus. Find an approximate 90% confidence interval for the proportion of all the adults in Fromleigh who travel by bus. [3]

[illegible]

- (b) The survey included a question about the amount, x dollars, spent on travel per year. The results are summarised as follows.

$$n = 250 \quad \Sigma x = 50\,460 \quad \Sigma x^2 = 19\,854\,200$$

Find unbiased estimates of the population mean and variance of the amount spent per year on travel. [3]

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A councillor wanted to select a random sample of houses in Fromleigh. He planned to select the first house on each of the 143 streets in Fromleigh.

- (c) Explain why this would not provide a random sample. [1]

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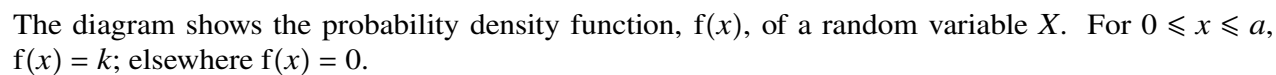
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- 3 The masses, in kilograms, of female and male animals of a certain species have the distributions $N(102, 27^2)$ and $N(170, 55^2)$ respectively.

Find the probability that a randomly chosen female has a mass that is less than half the mass of a randomly chosen male. [6]

[illegible]



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- [illegible]

5 The number of absences per week by workers at a factory has the distribution $\text{Po}(2.1)$.

- (a) Find the standard deviation of the number of absences per week. [1]

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- (b) Find the probability that the number of absences in a 2-week period is at least 2. [3]

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- (c) Find the probability that the number of absences in a 3-week period is more than 4 and less than 8. [2]

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Following a change in working conditions, the management wished to test whether the mean number of absences has decreased. They found that, in a randomly chosen 3-week period, there were exactly 2 absences.

- (d) Carry out the test at the 10% significance level. [5]

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- (e) State, with a reason, which of the errors, Type I or Type II, might have been made in carrying out the test in part (d). [2]

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- 6** The time, in minutes, for Anjan's journey to work on Mondays has mean 38.4 and standard deviation 6.9.
- (a)** Find the probability that Anjan's mean journey time for a random sample of 30 Mondays is between 38 and 40 minutes. [5]

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[illegible]

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