

Cambridge International AS & A Level

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

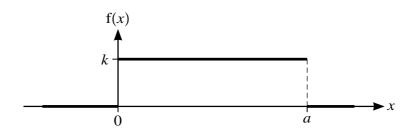
| (a) | Use an appropriate approximating distribution to find the probability that more than 1 flower in the sample is white. |
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| (b) | Justify the approximating distribution used in part (a). [1 |
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| The | probability that a randomly chosen flower of another kind is white is 0.02. A random sample o |
| | of these flowers is selected. |
| 150 | |
| 150 | of these flowers is selected. Use an appropriate approximating distribution to find the probability that the total number of |
| 150 | of these flowers is selected. Use an appropriate approximating distribution to find the probability that the total number o white flowers in the two samples is less than 4. |
| 150 | of these flowers is selected. Use an appropriate approximating distribution to find the probability that the total number o white flowers in the two samples is less than 4. |
| 150 | of these flowers is selected. 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] |
| 150 | Of these flowers is selected. Use an appropriate approximating distribution to find the probability that the total number o white flowers in the two samples is less than 4. [3] |
| 150 | Of these flowers is selected. Use an appropriate approximating distribution to find the probability that the total number o white flowers in the two samples is less than 4. [3] |
| | Use an appropriate approximating distribution to find the probability that the total number white flowers in the two samples is less than 4. |

In a survey, a random sample of 250 adults in Fromleigh were asked to fill in a questionnaire about

| the | ir travel. |
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| (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] |
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| | | n = 250 | $\Sigma x = 50460$ | $\Sigma x^2 = 19854200$ | |
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| | Find unbiased extravel. | stimates of the | e population mea | n and variance of the amount | spent per year on [3] |
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| | ouncillor wanted t | | | ouses in Fromleigh. He planned | d to select the first |
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| randomly ch | | a randomly | chosen fer | nale has a | mass that is l | ess than hali | f the mass of [(|
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The diagram shows the probability density function, f(x), of a random variable X. For $0 \le x \le a$, f(x) = k; elsewhere f(x) = 0.

| (a) | Express k in terms of a . | [1] |
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| (b) | Given that $Var(X) = 3$, find a . | [4] |
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| (a) | Find the standard deviation of the number of absences per week. | |
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| (b) | Find the probability that the number of absences in a 2-week period is at least 2. | |
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| (c) | Find the probability that the number of absences in a 3-week period is more than 4 than 8 . | and |
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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 mad out the test in part (d). | e in carrying [2] |
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The time, in minutes, for Anjan's journey to work on Mondays has mean 38.4 and standard deviation

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Anjan wishes to test whether his mean journey time is different on Tuesdays. He chooses a random sample of 30 Tuesdays and finds that his mean journey time for these 30 Tuesdays is 40.2 minutes. Assume that the standard deviation for his journey time on Tuesdays is 6.9 minutes.

| (i) | State, with a reason, whether Anjan should use a one-tail or a two-tail test. | [1] |
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| (ii) | Carry out the test at the 10% significance level. | [5] |
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| (iii) | Explain whether it was necessary to use the Central Limit theorem in part (b)(iii | i). [1] |
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Additional Page

| If you use the following lined page to complete the answer(s) to any question(s), the question number(s) must be clearly shown. |
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