Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

9228178848

MATHEMATICS **9709/62**

Paper 6 Probability & Statistics 2 **February/March 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 **12** pages. Any blank pages are indicated.

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1 A construction company notes the time, t days, that it takes to build each house of a certain design. The results for a random sample of 60 such houses are summarised as follows.

$$\Sigma t = 4820 \qquad \Sigma t^2 = 392\,050$$

(a) Calculate a 98% confidence interval for the population mean time. [6]

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(b) Explain why it was necessary to use the Central Limit theorem in part **(a)**. [1]

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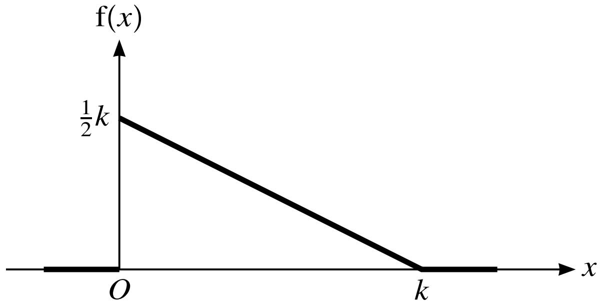

The diagram shows the graph of the probability density function, f, of a random variable X.

(a) Find the value of the constant k. [2]

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(b) Using this value of k, find $f(x)$ for $0 \leqslant x \leqslant k$ and hence find $E(X)$. [3]

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(c) Find the value of p such that $P(p < X < 1) = 0.25$. [4]

3 An architect wishes to investigate whether the buildings in a certain city are higher, on average, than buildings in other cities. He takes a large random sample of buildings from the city and finds the mean height of the buildings in the sample. He calculates the value of the test statistic, z, and finds that $z = 2.41$.

(a) Explain briefly whether he should use a one-tail test or a two-tail test. [1]

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(b) Carry out the test at the 1% significance level. [3]

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4 On average, 1 in 400 microchips made at a certain factory are faulty. The number of faulty microchips in a random sample of 1000 is denoted by X.

(a) State the distribution of X, giving the values of any parameters. [1]

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(b) State an approximating distribution for X, giving the values of any parameters. [2]

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(c) Use this approximating distribution to find each of the following.

(i) $P(X = 4)$. [2]

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(ii) $P(2 \leqslant X \leqslant 4)$. [2]

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(d) Use a suitable approximating distribution to find the probability that, in a random sample of 700 microchips, there will be at least 1 faulty one. [3]

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5 The volumes, in litres, of juice in large and small bottles have the distributions N(5.10, 0.0102) and N(2.51, 0.0036) respectively.

(a) Find the probability that the total volume of juice in 3 randomly chosen large bottles and 4 randomly chosen small bottles is less than 25.5 litres. [5]

(b) Find the probability that the volume of juice in a randomly chosen large bottle is at least twice the volume of juice in a randomly chosen small bottle. [5]

6 It is known that 8% of adults in a certain town own a Chantor car. After an advertising campaign, a car dealer wishes to investigate whether this proportion has increased. He chooses a random sample of 25 adults from the town and notes how many of them own a Chantor car.

(a) He finds that 4 of the 25 adults own a Chantor car.

Carry out a hypothesis test at the 5% significance level. [5]

(b) Explain which of the errors, Type I or Type II, might have been made in carrying out the test in part **(a)**. [2]

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Later, the car dealer takes another random sample of 25 adults from the town and carries out a similar hypothesis test at the 5% significance level.

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

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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.