

Cambridge International AS & A Level

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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.

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

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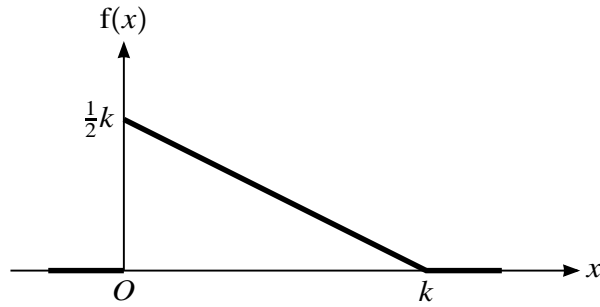
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The diagram shows the graph of the probability density function, f , of a random variable X .

(a) Find the value of the constant k .

[2]

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(b) Using this value of k , find $f(x)$ for $0 \leq x \leq k$ 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]

[illegible]

- 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) $P(2 \leq X \leq 4)$. [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]

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- (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]

[illegible]

- 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]

[illegible]

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

[illegible]

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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[illegible]

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