



Cambridge International AS & A Level

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MATHEMATICS

9709/62

Paper 6 Probability & Statistics 2

October/November 2022

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 **16** pages. Any blank pages are indicated.

- 1 Each of a random sample of 80 adults gave an estimate, h metres, of the height of a particular building. The results were summarised as follows.

$$n = 80 \quad \Sigma h = 2048 \quad \Sigma h^2 = 52\,760$$

- (a) Calculate unbiased estimates of the population mean and variance. [3]

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- (b) Using this sample, the upper boundary of an $\alpha\%$ confidence interval for the population mean is 26.0.

Find the value of α . [4]

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3 1.6% of adults in a certain town ride a bicycle. A random sample of 200 adults from this town is selected.

(a) Use a suitable approximating distribution to find the probability that more than 3 of these adults ride a bicycle. [4]

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(b) Justify your approximating distribution. [2]

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4 The number of faults in cloth made on a certain machine has a Poisson distribution with mean 2.4 per 10 m^2 . An adjustment is made to the machine. It is required to test at the 5% significance level whether the mean number of faults has decreased. A randomly selected 30 m^2 of cloth is checked and the number of faults is found.

(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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Exactly 3 faults are found in the randomly selected 30 m^2 of cloth.

- (c) Carry out the test at the 5% significance level. [2]

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Later a similar test was carried out at the 5% significance level, using another randomly selected 30 m^2 of cloth.

- (d) Given that the number of faults actually has a Poisson distribution with mean 0.5 per 10 m^2 , find the probability of a Type II error. [2]

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5 X is a random variable with distribution $B(10, 0.2)$. A random sample of 160 values of X is taken.

(a) Find the approximate distribution of the sample mean, including the values of the parameters. [3]

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(b) Hence find the probability that the sample mean is less than 1.8. [3]

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6 The masses, in grams, of small and large bags of flour have the distributions $N(510, 100)$ and $N(1015, 324)$ respectively. André selects 4 small bags of flour and 2 large bags of flour at random.

(a) Find the probability that the total mass of these 6 bags of flour is less than 4130 g. [5]

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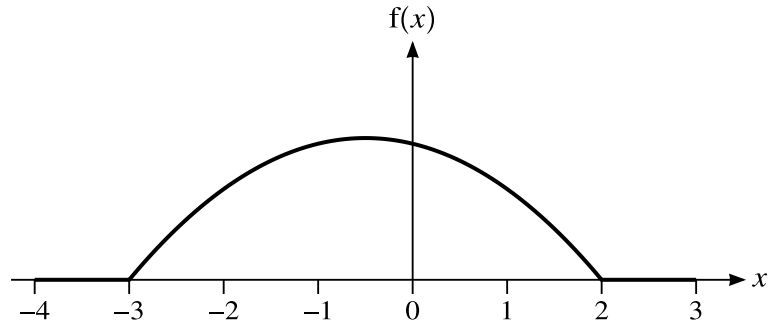
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(b) Find the probability that the total mass of the 4 small bags is more than the total mass of the 2 large bags. [5]

A series of horizontal dotted lines provided for the student's answer.



The diagram shows the graph of the probability density function, f , of a random variable X which takes values between -3 and 2 only.

- (a) Given that the graph is symmetrical about the line $x = -0.5$ and that $P(X < 0) = p$, find $P(-1 < X < 0)$ in terms of p . [2]

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- (b) It is now given that the probability density function shown in the diagram is given by

$$f(x) = \begin{cases} a - b(x^2 + x) & -3 \leq x \leq 2, \\ 0 & \text{otherwise,} \end{cases}$$

where a and b are positive constants.

- (i) Show that $30a - 55b = 6$. [3]

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(ii) By substituting a suitable value of x into $f(x)$, find another equation relating a and b and hence determine the values of a and b . [3]

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