



Cambridge International AS & A Level

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MATHEMATICS

9709/65

Paper 6 Probability & Statistics 2

May/June 2026

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. Do **not** use correction fluid or tape.
- 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.

- 1 It is known that, on average, 1 in 500 plants of a certain variety have a particular disease. A random sample of 250 plants of this variety is selected, and the number of plants with the disease is denoted by X .

(a) State the exact distribution of X . [1]

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(b) State an appropriate approximating distribution for X . [1]

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(c) Use your approximating distribution to find the probability that more than 2 plants in the sample have the disease. [2]

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Diseased plants occur at random and independently. Each day a scientist examines a selection of plants, and the number of diseased plants found per day is denoted by Y . The scientist finds that the mean of Y has approximately the same value every day, and this value is 32.

(d) Use an appropriate approximating distribution to find $P(Y < 20)$. [4]

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- 2 The volumes of regular and large coffees at a certain café have independent normal distributions. The mean and standard deviation of the volumes of regular coffees are 215 cm^3 and 2.8 cm^3 respectively. The mean and standard deviation of the volumes of large coffees are 330 cm^3 and 3.3 cm^3 respectively. Find the probability that the total volume of three randomly chosen regular coffees is greater than the total volume of two randomly chosen large coffees. [5]

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- 3** A researcher chose a random sample of 150 adults in Dombridge for a survey about dog ownership.

The number of adults in the survey who owned a dog was a . An approximate 94% confidence interval for the population proportion, p , of all the adults in Dombridge who owned a dog was calculated. The width of the interval was 0.13241, correct to 5 decimal places.

- (a) Calculate the two possible values of a . [5]

[illegible]

Two approximate 94% confidence intervals were found.

- (b) Given that at least one of these intervals contain the true value of p , find the probability that both intervals contain the true value of p . [3]

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The survey included a question about the distance, X kilometres, that the adults walked with their dog each day. The results were summarised as follows.

$$n = 150$$

$$\Sigma x = 462$$

$$\Sigma x^2 = 1485$$

- (c) Find unbiased estimates of the mean and variance of X . [3]

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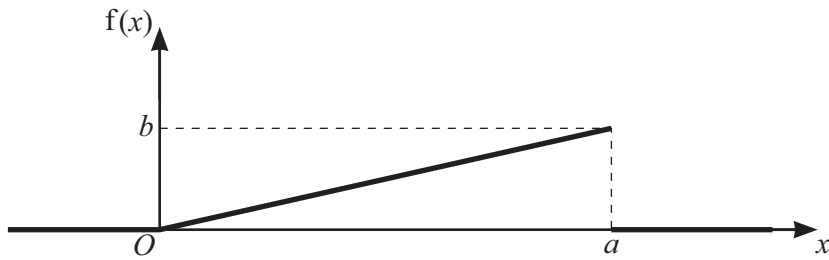
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The diagram shows the graph of the probability density function, $f(x)$, of a random variable X . For $0 \leq x \leq a$, the graph is a straight line from O to the point (a, b) , where a and b are constants. Elsewhere $f(x) = 0$.

- (a) Show that the median of X is $\frac{a}{\sqrt{2}}$.

[5]

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(b) Given that $E(X) = 4$, find a .

[4]

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- 5 The manufacturer of Beta cars claims that the proportion of adults in a certain town who own a Beta car is $\frac{1}{5}$. Raju suspects that the true proportion is less than $\frac{1}{5}$. He plans to carry out a hypothesis test using a random sample of 40 adults from the town. If fewer than 4 of these adults own a Beta car, he will conclude that the true proportion is less than $\frac{1}{5}$.
- (a) Use a binomial distribution to find the smallest significance level of the test. Give your answer correct to 3 significant figures. [3]

[illegible]

- (b) State the probability of a Type I error. [1]

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It is now given that the true proportion is $\frac{1}{20}$.

(c) Find the probability of a Type II error.

[3]

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- 6** In a certain country, the wingspan, in cm, of adult swans has the distribution $N(234.0, 6.9^2)$.
- (a)** Find the probability that the mean wingspan for a random sample of 25 adult swans is between 232.0 cm and 235.0 cm. [4]

[illegible]



A naturalist wishes to test whether the mean wingspan of adult swans in a particular region is different from 234.0 cm. He chooses a random sample of 25 swans in this region and finds that the mean wingspan is 236.3 cm. Assume that the standard deviation of the wingspans is 6.9 cm.

- (b) (i)** Carry out the test at the 5% significance level. [5]

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- (ii) Explain whether it was necessary to use the Central Limit Theorem in **6(b)(i)**. [1]

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