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Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

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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.

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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]

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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.

$$n = 150 \qquad \Sigma x = 462 \qquad \Sigma x^2 = 1485$$

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

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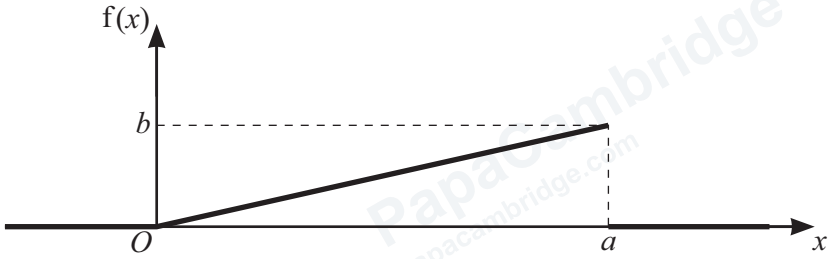
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The diagram shows the graph of the probability density function, $f(x)$, of a random variable X. For $0 \leqslant x \leqslant a$, the graph is a straight line from O to the point (a, b), where a and b are constants. Elsewhere $f(x) = 0$.

(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]

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(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]

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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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Additional page

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