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Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

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MATHEMATICS **9709/62**

Paper 6 Probability & Statistics 2 **October/November 2025**

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 The number, X, of used computers donated to a charity has a constant average rate of 2.4 computers per week.

(a) State a necessary condition for X to have a Poisson distribution. [1]

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Now assume that X has a Poisson distribution.

(b) Calculate the probability that the number of computers donated during a 4-week period is more than 6 and less than 9. [3]

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(c) Use a suitable approximating distribution to calculate the probability that more than 50 computers are donated during a 20-week period. [4]

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2 The random variable X has a normal distribution with mean 10 and standard deviation 3. The independent random variable Y has a Poisson distribution with mean 4.

(a) Find the standard deviation of $X+Y$. [3]

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(b) Find the standard deviation of $5X-Y$. [3]

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3 The times, in minutes, taken by students to complete a test have mean μ and standard deviation σ. The times taken by a random sample of 100 students are noted and are used to calculate a 95% confidence interval for μ.

(a) Given that the end points of the 95% confidence interval are 31.02 and 33.98, correct to 4 significant figures, calculate the value of σ. [3]

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(b) The calculation of the confidence interval required the use of the Central Limit theorem.

Explain why it is valid to use the Central Limit theorem in this case. [1]

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(c) A researcher calculates a number, r, of 95% confidence interval for μ.

Find the largest value of r such that the probability that all r confidence intervals contain the true value of μ is greater than 0.5. [4]

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4 An inspector believes that 18% of cups made at a certain factory contain flaws. The factory owner claims that the true percentage is less than 18%. The inspector examines a random sample of 40 cups and finds that 3 of them contain flaws.

(a) Stating a necessary assumption, use a binomial distribution to test the factory owner's claim at the 5% significance level. [6]

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(b) Explain why it would **not** be appropriate to use the Poisson approximation to the binomial distribution to carry out the test in part **(a)**. [1]

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5 A random variable X has probability density function given by

$$f(x) = \begin{cases} k(2x^2 - x^3) & 0 \leqslant x \leqslant 2, \\ 0 & \text{otherwise.} \end{cases}$$

(a) Show that $k = \frac{3}{4}$. [3]

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The median of X is denoted by m.

(b) (i) Write down the value of $P(X \leqslant m)$. [1]

(ii) Hence find $P(E(X) \leqslant X \leqslant m)$. [5]

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6 The weekly profit, in dollars, made by a certain firm has a normal distribution. In the past, the weekly profit had the distribution N(736, 26^2). Following a change in management, the mean weekly profit for 35 randomly chosen weeks is \$725.

(a) Stating a necessary assumption, test at the 2% significance level whether the mean weekly profit has decreased. [6]

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The mean weekly profit for another random sample of 35 weeks is found and a similar test is carried out at the 2% significance level.

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

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(c) Given that the mean weekly profit is now in fact \$718, find the probability of a Type II error. [5]

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