



Cambridge International AS & A Level

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MATHEMATICS

9709/65

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 A student notes the length, t minutes, of certain lectures. The results for a random sample of 80 lectures are summarised as follows.

$$n = 80 \qquad \Sigma t = 6430 \qquad \Sigma t^2 = 519\,740$$

- (a) Calculate a 96% confidence interval for the population mean length of the lectures. [6]

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- (b) The method used in part (a) is valid because the sample size was large. Explain why the method would not be valid if the sample size were small. [1]

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- 2 A researcher is investigating whether the proportion of families who do not own a car in his town is different from the proportion of the population in the whole country, which is 10.1%. He takes a large random sample of families in his town and finds the proportion of families that do not own a car.

(a) Explain why a two-tailed test is appropriate in this context. [1]

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(b) State suitable null and alternative hypotheses for the test. [1]

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The researcher calculates the value of the test statistic z and finds that $z = 1.82$. He carries out the test at the 5% significance level.

(c) State the conclusion of the test, explaining your answer. [2]

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- 3 A certain website receives an average of μ hits per hour. In the past the value of μ was 14.4. After making some improvements, the owner of the website wishes to test whether the value of μ has increased. He chooses a 10-minute period at random and finds that there were 6 hits during this period. You may assume that the number of hits the website receives in any given time period follows a Poisson distribution.

(a) Carry out the test at the 2.5% significance level. [6]

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(b) Explain whether it is possible that a Type I error or a Type II error or both may have been made in carrying out the test. [2]

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4 A sports fan produces a magazine each month.

(a) On average 1 in 540 characters in the magazine is incorrect.

(i) Use an appropriate approximating distribution to find the probability that, in a magazine containing 2430 characters, there are at least 4 incorrect characters. [3]

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(ii) Justify your approximating distribution. [1]

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(b) On average the number of copies, X , of the magazine sold per month is 123.4.

(i) State one condition for X to have a Poisson distribution.

[1]

You are now given that X has a Poisson distribution.

(ii) Use an appropriate approximating distribution to find the probability that in a randomly chosen month, more than 130 copies of the magazine are sold. [5]

[5]





- 5 The masses, in kg, of large and small bags of tomatoes have the distributions $L \sim N(2.10, 0.12)$ and $S \sim N(1.51, 0.09)$ respectively.

(a) Find $P(L > S + 0.5)$.

[5]

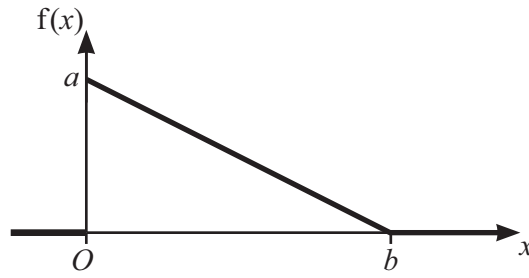
This image shows a full page of white paper with horizontal dashed lines, typical of primary school handwriting practice paper. The lines are evenly spaced and run across the entire width of the page. There are no margins, text, or other markings present.



The price of tomatoes is \$4.30 per kg.

- (b) A large bag of tomatoes and a small bag of tomatoes are chosen at random. Find the probability that the total price of the tomatoes in the two bags is less than \$16. [5]

[illegible]



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

- (a) Find an expression for b in terms of a . [2]

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- (b) Given that $E(X) = \frac{4}{9}$ find the value of a . [5]

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(c) Using the value of a found in part (b) find the value of k such that $P(X < k) = \frac{3}{4}$. [4]

[illegible]



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