



# Cambridge International AS & A Level

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## MATHEMATICS

9709/62

Paper 6 Probability &amp; Statistics 2

February/March 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 **16** pages. Any blank pages are indicated.

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- 1** The random variables  $X$  and  $Y$  have the independent distributions  $N(44, 16)$  and  $N(30, 9)$  respectively.

Find  $P(X - Y < 15)$ .

[5]

[illegible]



- 2 A researcher records the time,  $T$  seconds, taken by adults to complete a questionnaire.

The results for a random sample of 60 adults who completed the questionnaire this year are summarised as follows.

$$n = 60 \qquad \Sigma t = 3678 \qquad \Sigma t^2 = 226\,313.36$$

- (a) Find an unbiased estimate of  $E(T)$ , and show that an unbiased estimate of  $\text{Var}(T)$  is 14.44. [3]

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In the past, the population mean time was 62.4 seconds.

- (b) Test at the 2% significance level whether the population mean time for this year is less than 62.4 seconds. [5]

[illegible]

- (c) State, with a reason, whether it was necessary to use the Central Limit Theorem in your answer to part (b). [1]

[illegible]





- (c) The sum of a large number,  $n$ , of values of  $X$  is denoted by  $T$ . Using a suitable approximation, it was found that  $P(T > 330) = 0.0391$ , correct to 3 significant figures.

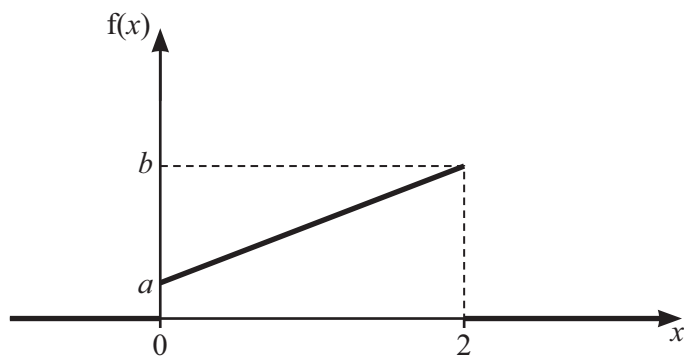
Find the value of  $n$ .

[5]

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**4 (a)**



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  $(2, b)$ , where  $a$  and  $b$  are positive constants. Elsewhere,  $f(x) = 0$ .

- (i) Show that  $b = 1 - a$ . [2]

.....

.....

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- (ii) Given that  $E(X) = 1.2$ , find the value of  $a$ . [5]

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**(b)** A random variable  $T$  has probability density function given by

$$g(t) = \begin{cases} \frac{1}{2} \cos t & -\frac{1}{2}\pi \leq t \leq \frac{1}{2}\pi, \\ 0 & \text{otherwise.} \end{cases}$$

Find the value of  $c$  such that  $P(-c < t < c) = \frac{1}{2}$ . [4]





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It is now given that the true value of  $p$  is 0.05.

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

[3]

[illegible]

- Nikki's friend says, "This survey is about sports facilities, so you should choose a sample of students from the school sports teams."

- .....
- .....
- .....

Nikki chooses an appropriate random sample of 60 students. She finds that 45 of these students think that the sports facilities are good.

- [illegible]



For a different investigation, Nikki uses another large random sample to calculate a 99% confidence interval and an  $x\%$  confidence interval.

The width of the 99% confidence interval is double the width of the  $x\%$  confidence interval.

(c) Calculate the value of  $x$ .

[4]

[illegible]



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[illegible]

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