Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

1060122122

MATHEMATICS **9709/61**

Paper 6 Probability & Statistics 1 **(S1)** **October/November 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: List of Formulae (MF9)

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions in the space provided. If additional space is required, you should use the lined page at the end of this booklet. The question number(s) must be clearly shown.
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
The use of an electronic calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 50.

This document consists of **14** printed pages and **2** blank pages.

1 When Shona goes to college she either catches the bus with probability 0.8 or she cycles with probability 0.2. If she catches the bus, the probability that she is late is 0.4. If she cycles, the probability that she is late is x. The probability that Shona is not late for college on a randomly chosen day is 0.63. Find the value of x. [3]

2 Annan has designed a new logo for a sportswear company. A survey of a large number of customers found that 42% of customers rated the logo as good.

(i) A random sample of 10 customers is chosen. Find the probability that fewer than 8 of them rate the logo as good. [3]

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(ii) On another occasion, a random sample of n customers of the company is chosen. Find the smallest value of n for which the probability that at least one person rates the logo as good is greater than 0.995. [3]

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3 The mean and standard deviation of 20 values of x are 60 and 4 respectively.

(i) Find the values of Σx and Σx^2. [3]

Another 10 values of x are such that their sum is 550 and the sum of their squares is 40 500.

(ii) Find the mean and standard deviation of all these 30 values of x. [4]

4 In a probability distribution the random variable X takes the values -1, 0, 1, 2, 4. The probability distribution table for X is as follows.

x	-1	0	1	2	4
$\mathrm{P}(X = x)$	$\frac{1}{4}$	p	p	$\frac{3}{8}$	$4p$

(i) Find the value of p. [2]

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(ii) Find $\mathrm{E}(X)$ and $\mathrm{Var}(X)$. [3]

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(iii) Given that X is greater than zero, find the probability that X is equal to 2. [2]

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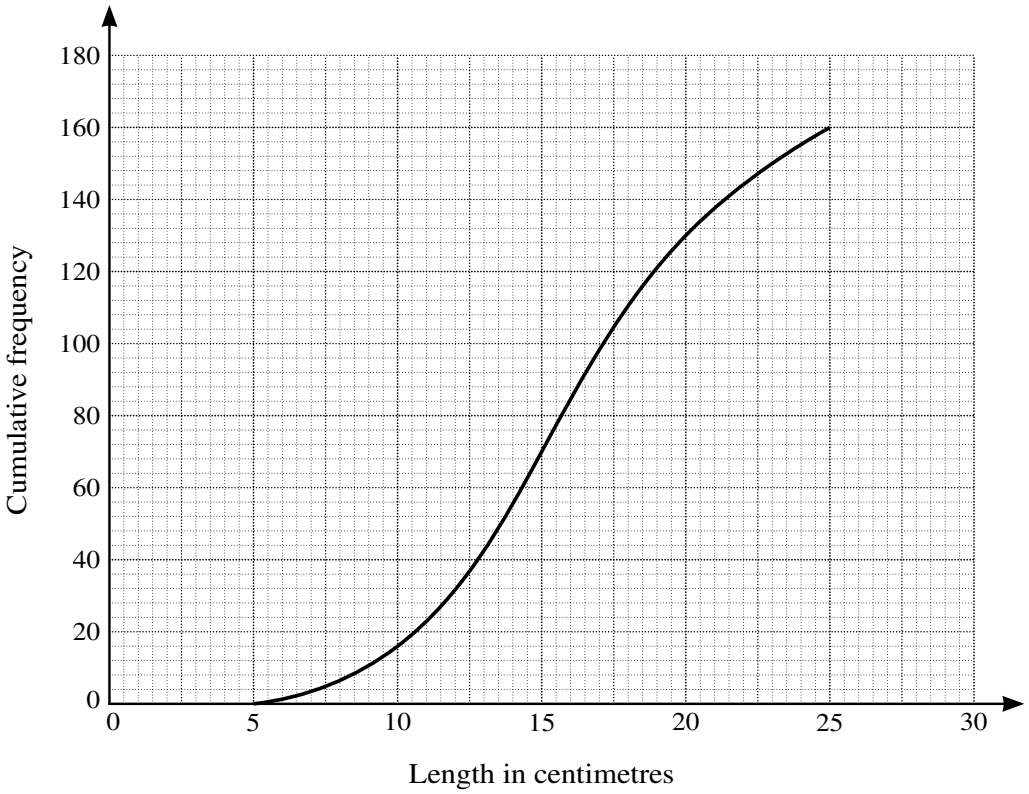
5 Ransha measured the lengths, in centimetres, of 160 palm leaves. His results are illustrated in the cumulative frequency graph below.



(i) Estimate how many leaves have a length between 14 and 24 centimetres. [1]

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(ii) 10% of the leaves have a length of L centimetres or more. Estimate the value of L. [2]

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(iii) Estimate the median and the interquartile range of the lengths. [3]

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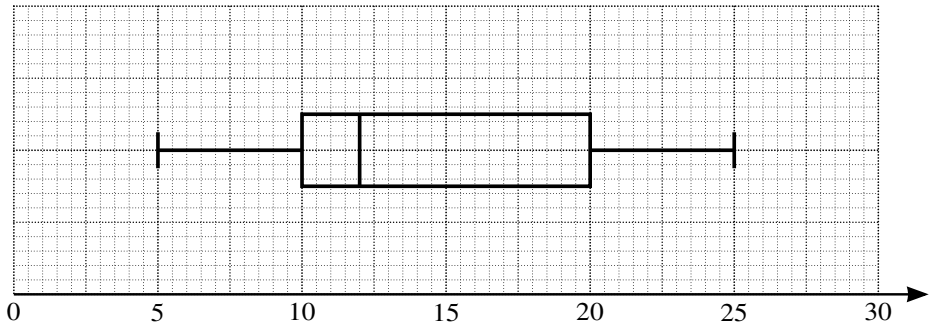
Sharim measured the lengths, in centimetres, of 160 palm leaves of a different type. He drew a box-and-whisker plot for the data, as shown on the grid below.



Length in centimetres

(iv) Compare the central tendency and the spread of the two sets of data. [2]

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6 **(i)** Find the number of different ways in which all 12 letters of the word STEEPLECHASE can be arranged so that all four Es are together. [1]

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(ii) Find the number of different ways in which all 12 letters of the word STEEPLECHASE can be arranged so that the Ss are not next to each other. [4]

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Four letters are selected from the 12 letters of the word STEEPLECHASE.

(iii) Find the number of different selections if the four letters include exactly one S. [4]

7 The shortest time recorded by an athlete in a 400 m race is called their personal best (PB). The PBs of the athletes in a large athletics club are normally distributed with mean 49.2 seconds and standard deviation 2.8 seconds.

(i) Find the probability that a randomly chosen athlete from this club has a PB between 46 and 53 seconds. [4]

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(ii) It is found that 92% of athletes from this club have PBs of more than t seconds. Find the value of t. [3]

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Three athletes from the club are chosen at random.

(iii) Find the probability that exactly 2 have PBs of less than 46 seconds. [3]

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Additional Page

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