

**STATISTICS (Q 7, PAPER 2)**

**1996**

- 7 (a) The numbers 3, 5, 6,  $x$ , 9, 2 have a mean of 6.  
Find  $x$ .
- (b) The cumulative frequency table below shows the number of minutes taken by 80 people to complete a crossword:

Minutes	$\leq 10$	$\leq 20$	$\leq 30$	$\leq 40$	$\leq 50$	$\leq 60$
Cumulative Frequency	3	13	39	59	73	80

Draw a cumulative frequency curve.

Use your curve to estimate

- (i) the median time to complete the crossword
- (ii) the interquartile range.
- (c) The grouped frequency table below shows the minutes spent in a shopping complex by a number of people:

Minutes	5 – 15	15 – 25	25 – 35	35 – 65
Number of people	10	50	80	60

Note that 5–15 means that 5 is included but 15 is not, etc.

- (i) Draw a histogram to illustrate the data.
- (ii) Calculate the mean number of minutes spent per person in the shopping complex, taking 10, 20 etc. as mid-interval values.

**SOLUTION**

**7 (a)**

The **MEAN** or **AVERAGE** of a set of numbers is calculated by adding the numbers together and dividing by the number of numbers.

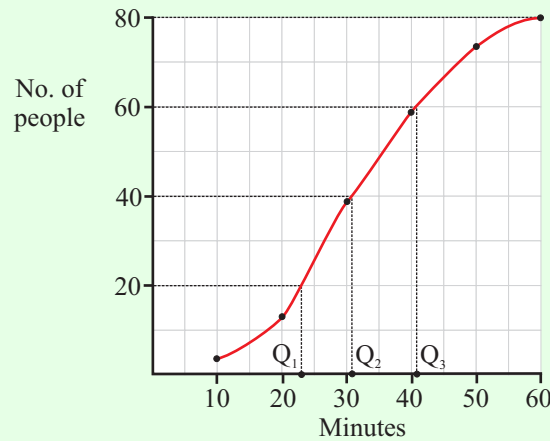
$$\text{Mean} = \frac{\text{Sum of the numbers}}{\text{Number of numbers}}$$

The mean is denoted by  $\bar{x}$ .

$$\bar{x} = \frac{x_1 + x_2 + \dots + x_N}{N} = \frac{\text{Sum of the Numbers}}{\text{Number of Numbers}} = \frac{\sum x}{N} \dots\dots \mathbf{1}$$

$$\begin{aligned} \bar{x} &= \frac{\sum x}{N} \Rightarrow 6 = \frac{3+5+6+x+9+2}{6} \\ \Rightarrow 36 &= x+25 \\ \therefore x &= 11 \end{aligned}$$

**7 (b)**



**7 (b) (i)**

**Finding the Median ( $Q_2$ ):** The total number of people who did the crossword was 80. Half of this number is 40. The median time as you can see from the graph is 31 minutes.

**7 (b) (ii)**

**The lower quartile ( $Q_1$ ):** Go to 20 on the vertical axis (one-quarter of the people). The lower quartile is 23 minutes.

**The upper quartile ( $Q_3$ ):** Go to 60 on the vertical axis (three-quarters of the people). The upper quartile is 41 minutes.

**The interquartile range:**  $Q_3 - Q_1 = 41 - 23 = 18$  minutes.

**7 (c) (i)**

Minutes	5 – 15	15 – 25	25 – 35	35 – 65
Number of people	10	50	80	60

Each column in the table is represented by a rectangular box. The area of the box corresponds to the frequency (no. of people).

$$\text{Area (No. of students)} = \text{Base} \times \text{Height} = \text{Frequency}$$

Look at the minutes. Pick out the smallest interval (5 – 15) and make this base one unit. Therefore the interval 35 – 65 has a base of 3 units. Divide the base into the area (frequency) to get the height of a box.

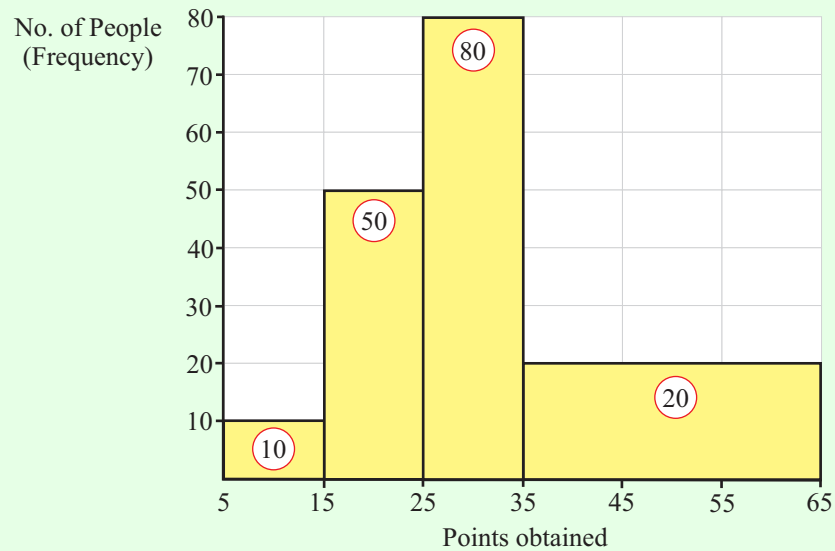
Draw a new table:

Interval (Minutes)	5 – 15	15 – 25	25 – 35	35 – 65
Number of people	10	50	80	60
Base	1	1	1	3
Height	10	50	80	20

Drawing the histogram:

**Horizontal (x-axis) axis (Minutes):** Look at the intervals. The minutes go from 5 to 65. The smallest interval (Base 1) is 10 so go up in 10's.

**Vertical (y-axis) axis (No. of people):** Always start at zero. The biggest number is the maximum height (i.e. 80).



**7 (c) (ii)**

Draw up a frequency table using the mid-interval values. To get a mid-interval value add the two numbers together and divide by 2.

$$\bar{x} = \frac{f_1x_1 + f_2x_2 + \dots + f_Nx_N}{f_1 + f_2 + \dots + f_N} = \frac{\sum fx}{\sum f} \dots\dots 2$$

<i>x</i>	<i>f</i>	<i>fx</i>
10	10	100
20	50	1000
30	80	2400
50	60	3000
	200	6500

Mean time:  $\bar{x} = \frac{\sum fx}{\sum f} = \frac{6500}{200} = 32.5$  minutes