STATISTICS (Q 7, PAPER 2)

**2008**

7 (a) The ages of the members of a sports centre were analysed. The results were:

Age	15–25	25–35	35–45	45–55	55–75
Number of members	40	100	60	80	120

[Note: 25–35 means 25 years old or more but less than 35, etc.]
(i) Draw a histogram to represent the data.

(ii) By taking the data at the mid-interval values, calculate the mean age per member.

(iii) What is the greatest possible number of members who could have been over 60 years of age?

(b) The amount of money spent by shoppers in a supermarket over a particular time period was recorded. The results are represented by the ogive below:
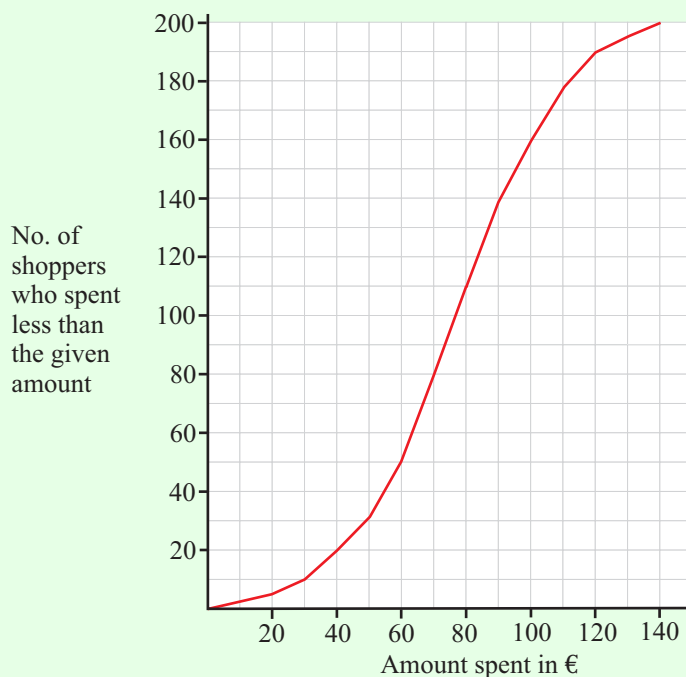
(i) Estimate the median amount spent.

(ii) Estimate the interquartile range.

(iii) Estimate the number of shoppers who spent between €40 and €100.

(iv) Given that the mean amount spent was €80 per shopper, estimate the percentage of shoppers who spent more than the mean amount.

SOLUTION

7 (a) (i)

Age	15–25	25–35	35–45	45–55	55–75
Number of members	40	100	60	80	120

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

Area (No. of students) = Base × Height = Frequency

Look at the ages. Pick out the smallest interval (15–25) and make this base one unit. Therefore the interval 55–75 has a base of 2 units. Divide the base into the area (frequency) to get the height of a box.
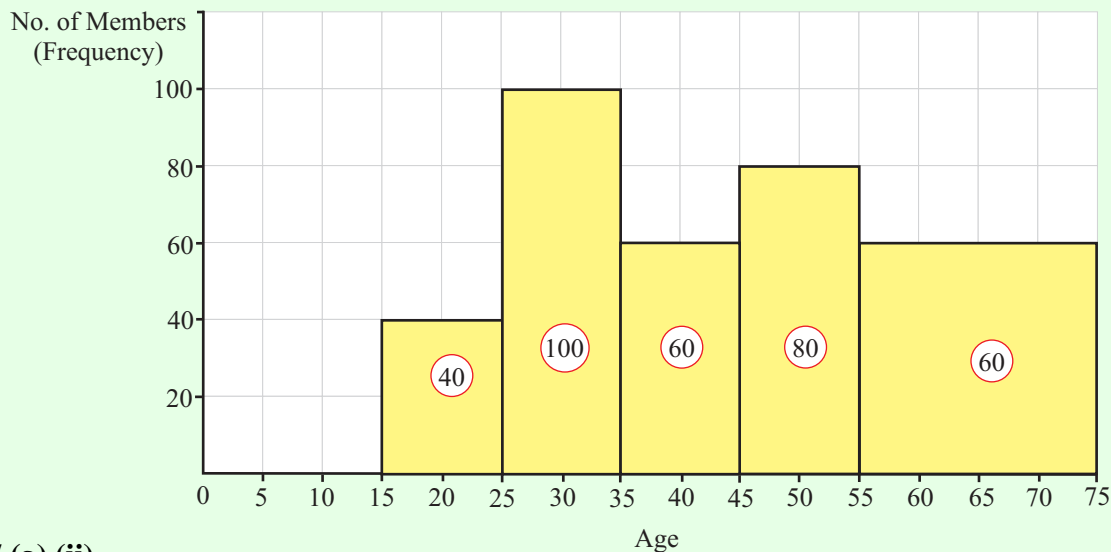
Draw a new table:

Interval (Age)	15–25	25–35	35–45	45–55	55–75
Frequency (No. of members)	40	100	60	80	120
Base	1	1	1	1	2
Height	40	100	60	80	60

Drawing the histogram:

Horizontal (x-axis) axis (Age): Look at the intervals. The times go from 0 to 75. Go up in 5's.

Vertical (y-axis) axis (No. of members): Always start at zero. The biggest number is the maximum height (i.e. 100).

7 (a) (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.

Ex. Class interval: 15–25

Mid-interval value: $\dfrac{15+25}{2} = 20$

$$\bar{x} = \frac{f_1 x_1 + f_2 x_2 + \ldots\ldots + f_N x_N}{f_1 + f_2 + \ldots\ldots\ldots + f_N} = \frac{\sum fx}{\sum f} \quad \ldots\ldots \text{ ❷}$$

x	f	fx
20	40	800
30	100	3000
40	60	2400
50	80	4000
65	120	7800
	400	18000

Mean age: $\bar{x} = \dfrac{\sum fx}{\sum f} = \dfrac{18000}{400} = 45$

7 (a) (iii)

It is possible that all the members in the 55–75 interval or over 60 years of age.
Therefore, the greatest possible number of members who could have been over 60 years of age is 120.

7 (b)
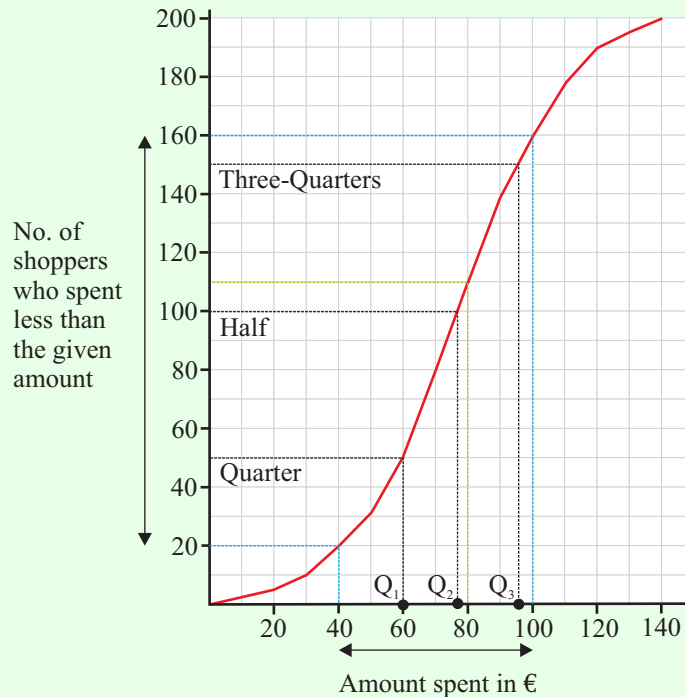
7 (b) (i)

Median (Q_2): The total number of shoppers was 200. Half of this number is 100. The median is €78.

7 (b) (ii)

The lower quartile (Q_1): Go to 50 on the vertical axis (one-quarter of the shoppers). The lower quartile is €60.
The upper quartile (Q_3): Go to 150 on the vertical axis (three-quarters of the shoppers). The upper quartile is €95.
The interquartile range: $Q_3 - Q_1 = €95 - €60 = €35$

7 (b) (iii)

Go to €40 and €100 on the horizontal axis. Using the blue broken lines read off the number of shoppers.
No. of shoppers $= 160 - 20 = 140$

7 (b) (iv)

Go to €80 on the horizontal axis. Using the green broken line read off the number of shoppers which is 110. Therefore, the number of shoppers who spent more that the mean amount is 90.

% of shoppers spending more than mean amount $= \dfrac{90}{200} \times 100\% = 45\%$