

STATISTICS (Q 7, PAPER 2)

2001

- 7 (a) (i) Calculate the mean of the following numbers
2, 3, 5, 7, 8.
- (ii) Hence, calculate the standard deviation of the numbers correct to one decimal place.
- (b) The following table shows the distribution of the amounts spent by 40 customers in a shop:

Amount Spent (IR£)	0 – 8	8 – 12	12 – 16	16 – 20	20 – 32
Number of Customers	2	9	13	10	6

[Note: IR£8 - IR£12 means IR£8 or over but less than IR£12 etc.]

- (i) Taking mid-interval values, estimate the mean amount spent by the customers.
- (ii) Copy and complete the following cumulative frequency table:

Amount Spent (IR£)	< 8	< 12	< 16	< 20	< 32
Number of Customers					

- (iii) Draw a cumulative frequency curve (ogive).
- (iv) Use your curve to estimate the number of customers who spent IR£25 or more.

SOLUTION

7 (a) (i)

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} .

$$\bar{x} = \frac{2 + 3 + 5 + 7 + 8}{5}$$

$$\Rightarrow \bar{x} = \frac{25}{5} = 5$$

$\bar{x} = \frac{x_1 + x_2 + \dots + x_N}{N} = \frac{\text{Sum of the Numbers}}{\text{Number of Numbers}} = \frac{\sum x}{N}$ 1
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7 (a) (ii)

STEPS

1. Find the mean.
2. Draw up a table of x , d and d^2 .
3. Apply the standard deviation formula.

1. This is done in part (i).

$$\bar{x} = 5$$

2.

The deviation, d , is given by the formula:

$$d = (x - \bar{x}) = (\text{Number} - \text{Mean}).$$

To work out d , get the difference between each number, x , and the mean, \bar{x} .

x	d	d^2
2	-3	9
3	-2	4
5	0	0
7	2	4
8	3	9
		26

3. $\sigma = \sqrt{\frac{26}{5}} = 2.3$

$$\sigma = \sqrt{\frac{\text{Sum of (Deviations)}^2}{\text{Number of numbers}}} = \sqrt{\frac{\sum d^2}{N}} \dots\dots 4$$

7 (b) (i)

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: 8 – 12

Mid-interval value: $\frac{8+12}{2} = 10$

x	f	fx
4	2	8
10	9	90
14	13	182
18	10	180
26	6	156
	40	616

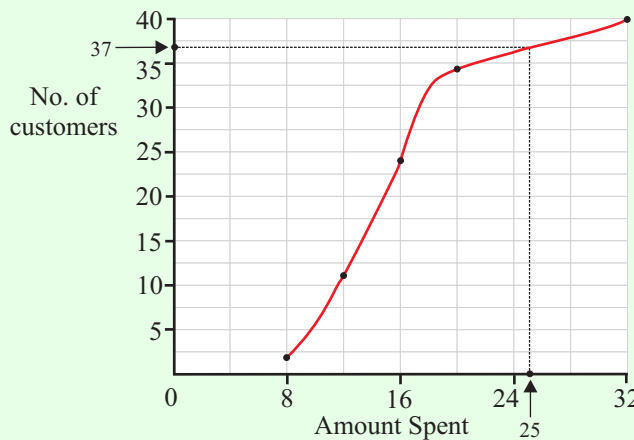
$$\bar{x} = \frac{f_1x_1 + f_2x_2 + \dots + f_Nx_N}{f_1 + f_2 + \dots + f_N} = \frac{\sum fx}{\sum f} \dots\dots 2$$

Mean price: $\bar{x} = \frac{\sum fx}{\sum f} = \frac{616}{40} = \text{€}15.40$

7 (b) (ii)

Amount Spent (IR£)	< 8	< 12	< 16	< 20	< 32
Number of Customers	2	11	24	34	40

7 (b) (iii)



7 (b) (iv)

Go to £25 on the horizontal axis. Draw a line straight up until it meets the curve and then go across where, as you can see, there are 37 customers. Therefore, the number of customers who spent more that £35 is $40 - 37 = 3$ customers.