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(Affiliated to CBSE up to +2 Level)

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Class X Math

Question 1. The following frequency distribution gives the monthly consumption of electricity of 68 consumers of a locality. Find the median, mean and mode of the data and compare them.

Monthly consumption (in units)	65 – 85	85 – 105	105 – 125	125 – 145	145 – 165	165 – 185	185 – 205
No. of consumers	4	5	13	20	14	8	4

Solution:

Monthly consumption (in units)	Number of consumers (f_i)	Cumulative frequency (cf)	Class mark (x_i)	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
65 – 85	4	4	75	-3	-12
85 – 105	5	9	95	-2	-10
105 – 125	13	22	115	-1	-13
125 – 145	20	42	135 = a (Let)	0	0
145 – 165	14	56	155	1	14
165 – 185	8	64	175	2	16
185 – 205	4	68	195	3	12
Total	$\Sigma f_i = 68$				$\Sigma f_i u_i = 7$

We have,
$$\text{Mean} = a + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h = 135 + \frac{7}{68} \times 20 = 135 + \frac{35}{17}$$

$$= 135 + 2.06 = 137.06 \text{ units}$$

Here, $n = 68, \frac{n}{2} = \frac{68}{2} = 34,$

\therefore Median class = 125 – 145

Here, $l = 125, n = 68, f = 20, cf = 22, h = 20$

$$\text{Median} = l + \left(\frac{\frac{n}{2} - cf}{f} \right) \times h = 125 + \left(\frac{34 - 22}{20} \right) \times 20$$

$$= 125 + 12 = 137 \text{ units}$$

Maximum frequency = 20

Modal class = 125 – 145 Here, $l = 125, f_0 = 13, f_1 = 20, f_2 = 14$

$$\therefore \text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h = 125 + \left(\frac{20 - 13}{40 - 13 - 14} \right) \times 20$$

$$= 125 + \frac{7 \times 20}{13} = 125 + \frac{140}{13} = 125 + 10.76 = 135.76 \text{ units}$$

Mean > Median > Mode

Question 2. If the median of the distribution given below is 28.5, find the values of x and y.

Class-interval	Frequency
0 - 10	5
10 - 20	x
20 - 30	20
30 - 40	15
40 - 50	y
50 - 60	5
Total	60

Solution:

Class interval	Frequency	Cumulative frequency
0 - 10	5	5
10 - 20	x	$5 + x(c)$
20 - 30	20(f)	$25 + x$
30 - 40	15	$40 + x$
40 - 50	y	$40 + x + y$
50 - 60	5	$45 + x + y$
Total	$n = 60$	

We have $45 + x + y = 60$... (i) [Given]

$$\therefore n = 60 \quad \therefore \frac{n}{2} = \frac{60}{2} = 30$$

Since the median lies in the class interval (20 - 30), so the median class is (20 - 30).

Hence, $l = 20$, $f = 20$, $cf = 5 + x$ and $h = 10$.

$$\therefore \text{Median} = l + \left(\frac{\frac{n}{2} - cf}{f} \right) \times h$$

$$\Rightarrow 28.5 = 20 + \left(\frac{30 - 5 - x}{20} \right) \times 10$$

$$\Rightarrow 28.5 = 20 + \left(\frac{25 - x}{2} \right)$$

$$\Rightarrow 57 = 40 + 25 - x \Rightarrow 25 - x = 57 - 40$$

$$\Rightarrow 25 - x = 17 \quad \Rightarrow x = 25 - 17 = 8.$$

Putting $x = 8$ in equation (i), we get:

$$\Rightarrow 45 + 8 + y = 60 \quad \Rightarrow y = 60 - 53 = 7.$$