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Class X Math

Question 4. The following distribution gives the state-wise teacher- student ratio in higher secondary schools of India. Find the mode and mean of this data. Interpret the two measures.

Here, $h = 5$.

Class interval	Frequency f_i	Class marks x_i	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
15 – 20	3	17.5	-3	-9
20 – 25	8	22.5	-2	-16
25 – 30	9 (f_1)	27.5	-1	-9
30 – 35	10 (f_m)	32.5 = a	0	0
35 – 40	3 (f_2)	37.5	1	3
40 – 45	0	42.5	2	0
45 – 50	0	47.5	3	0
50 – 55	2	52.5	4	8
	$\Sigma f_i = 35$			$\Sigma f_i u_i = -23$

Solution:

Since the maximum frequency is 10, so the modal class is (30 – 35).

Here, $l = 30$, $f_m = 10$, $f_1 = 9$, $f_2 = 3$, $h = 5$ and $a = 32.5$

$$\begin{aligned}\therefore \text{Mode} &= l + \left(\frac{f_m - f_1}{2f_m - f_1 - f_2} \right) \times h \\ &= 30 + \left(\frac{10 - 9}{2 \times 10 - 9 - 3} \right) \times 5 \\ &= 30 + \frac{5}{20 - 12} = 30 + 0.63 \\ &= \mathbf{30.63}.\end{aligned}$$

$$\begin{aligned}\text{Mean} &= a + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h = 32.5 + \frac{(-23)}{35} \times 5 \\ &= 32.5 - 3.28 = \mathbf{29.22}.\end{aligned}$$

Question 5. The given distribution shows the number of runs scored by some top batsmen of the world in one-day international cricket matches. Find the mode of the data.

Solution:

Runs scored	Number of batsmen (f_i)
3000 – 4000	4
4000 – 5000	18
5000 – 6000	9
6000 – 7000	7
7000 – 8000	6
8000 – 9000	3
9000 – 10000	1
10000 – 11000	1

Maximum frequency = 18,

\therefore Modal class = 4000 – 5000; Here, $l = 4000, f_0 = 4, f_1 = 18, f_2 = 9$

$$\begin{aligned}\text{Mode} &= l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h = 4000 + \left(\frac{18 - 4}{36 - 4 - 9} \right) \times 1000 \\ &= 4000 + \frac{14000}{23} = 4000 + 608.7 = 4608.7 \text{ runs}\end{aligned}$$

Question 6. A student noted the number of cars passing through a spot on a road for 100 periods each of 3 minutes and summarized it in the table given below. Find the mode of the data:

Number of cars	Frequency
0 – 10	7
10 – 20	14
20 – 30	13
30 – 40	12
40 – 50	20
50 – 60	11
60 – 70	15
70 – 80	8

Solution:

Since 20 is the maximum frequency, so modal class is (40 – 50).

Here, $l = 40, f_m = 20, f_1 = 12, f_2 = 11$ and $h = 10$.

$$\begin{aligned}\therefore \text{Mode} &= l + \left(\frac{f_m - f_1}{2f_m - f_1 - f_2} \right) \times h \\ &= 40 + \left(\frac{20 - 12}{2 \times 20 - 12 - 11} \right) \times 10 \\ &= 40 + \frac{80}{17} = 40 + 4.7 = \mathbf{44.7 \text{ cars.}}\end{aligned}$$