



# VIDYA BHAWAN, BALIKA VIDYAPITH

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(Affiliated to CBSE up to +2 Level)

Class : 10<sup>th</sup>

Subject: Mathematics

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Class X Math

## Ex 14.2

Question 1 The following table shows the ages of the patients admitted in a hospital during a year.

Age (in years)	No. of patients
5 – 15	6
15 – 25	11
25 – 35	21
35 – 45	23
45 – 55	14
55 – 65	5

Find the mode and the mean of the data given above. Compare and interpret the two measures of central tendency.

**Solution:**

For Mode:

Age (in years)	5–15	15–25	25–35	35–45	45–55	55–65
Number of patients	6	11	21	23	14	5

$\therefore$  Maximum frequency = 23

$\therefore$  Modal class = 35 – 45

Here,  $l = 35, f_1 = 23, f_0 = 21, f_2 = 14, h = 10$

$$\begin{aligned}\text{Mode} &= l + \left[ \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right] \times h = 35 + \left[ \frac{23 - 21}{46 - 21 - 14} \right] \times 10 = 35 + \frac{2}{11} \times 10 \\ &= 35 + \frac{20}{11} = 36.8 \text{ years}\end{aligned}$$

For Mean:

Age (in years)	Class mark ( $x_i$ )	Number of patients ( $f_i$ )	$u_i = \frac{x_i - 30}{10}$	$f_i u_i$
5 – 15	10	6	-2	-12
15 – 25	20	11	-1	-11
25 – 35	30 = a (Let)	21	0	0
35 – 45	40	23	1	23
45 – 55	50	14	2	28
55 – 65	60	5	3	15
Total		$\Sigma f_i = 80$		$\Sigma f_i u_i = 43$

Here,  $a = 30, \Sigma f_i u_i = 43, \Sigma f_i = 80, h = 10$

We have, Mean =  $a + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h = 30 + \frac{43 \times 10}{80} = 30 + 5.37 = 35.37$  years

We conclude that the maximum number of patients in the hospital are of the age 36.8 years. While on an average the age of patient admitted to the hospital is 35.37 years.

Question 2. The following data gives information on the observed lifetimes (in hours) of 225 electrical components:

Life times (in hours)	Frequency
0 – 20	10
20 – 40	35
40 – 60	52
60 – 80	61
80 – 100	38
100 – 120	29

Determine the modal lifetimes of the components.

Solution:

Modal class is 60 – 80, as 61 is maximum frequency.

Here,  $l = 60$ ,  $f_m = 61$ ,  $f_1 = 52$ ,  $f_2 = 38$ , and  $h = 20$ .

$$\begin{aligned}
 \therefore \text{Mode} &= l + \left( \frac{f_m - f_1}{2f_m - f_1 - f_2} \right) \times h \\
 &= 60 + \left( \frac{61 - 52}{122 - 52 - 38} \right) \times 20 \\
 &= 60 + \frac{9 \times 20}{32} = 60 + \frac{45}{8} \\
 &= 60 + 5.63 = \mathbf{65.63 \text{ hr.}}
 \end{aligned}$$

Question 3. The following data gives the distribution of total monthly household expenditure of 200 families of a village. Find the modal monthly expenditure of the families. Also, find the mean monthly expenditure:

Expenditure (in ₹)	Number of families
1000 – 1500	24
1500 – 2000	40
2000 – 2500	33
2500 – 3000	28
3000 – 3500	30
3500 – 4000	22
4000 – 4500	16
4500 – 5000	7

**Solution:**

Here, Maximum frequency = 40

∴ Modal class = 1500 – 2000 and  $l = 1500, f_0 = 24, f_1 = 40, f_2 = 33$

$$\begin{aligned} \text{Mode} &= l + \left( \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h = 1500 + \left( \frac{40 - 24}{80 - 24 - 33} \right) \times 500 \\ &= 1500 + \frac{16}{23} \times 500 = 1500 + 347.83 = ₹ 1847.83 \end{aligned}$$

**For Mean**

Expenditure (in ₹)	Class mark ( $x_i$ )	Number of families( $f_i$ )	$u_i = \frac{x_i - 2750}{500}$	$f_i u_i$
1000 – 1500	1250	24	-3	-72
1500 – 2000	1750	40	-2	-80
2000 – 2500	2250	33	-1	-33
2500 – 3000	2750 = $a$ (Let)	28	0	0
3000 – 3500	3250	30	1	30
3500 – 4000	3750	22	2	44
4000 – 4500	4250	16	3	48
4500 – 5000	4750	7	4	28
Total		$\Sigma f_i = 200$		$\Sigma f_i u_i = -35$

Here,  $a = 2750, \Sigma f_i = 200, \Sigma f_i u_i = -35, h = 500$

$$\begin{aligned} \therefore \text{Mean} &= a + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h \\ &= 2750 + \frac{(-35)}{200} \times 500 = 2750 - \frac{175}{2} \\ &= 2750 - 87.50 = ₹ 2662.50 \end{aligned}$$