

HOTS (Higher Order Thinking Skills)

Que 1. The mean of the following frequency table is 50. But the frequencies f_1 and f_2 in class 20 – 40 and 60 – 80 respectively are missing. Find the missing frequencies.

Classes	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100	Total
Frequency	17	f_1	32	f_2	19	120

Sol. Let the assumed mean $A = 50$ and $h = 20$.

Calculation of mean

Class interval	Mid-values (x_i)	Frequency (f_i)	$u_i = \frac{x_i - 50}{20}$	$f_i u_i$
0 – 20	10	17	-2	-34
20 – 40	30	f_1	-1	$-f_1$
40 – 60	50	32	0	0
60 – 80	70	f_2	1	f_2
80 – 100	90	19	2	38
Total		$\Sigma f_i = 68 + f_1 + f_2$		$\Sigma f_i u_i = 4 - f_1 + f_2$

We have, $\Sigma f_i = 120$ [Given]

$$\Rightarrow 68 + f_1 + f_2 = 120$$

$$\Rightarrow f_1 + f_2 = 52 \quad \dots(i)$$

Now, Mean = 50

$$\Rightarrow \bar{x} = A + h \left(\frac{\Sigma f_i u_i}{\Sigma f_i} \right) \Rightarrow 50 = 50 + 20 \times \left\{ \frac{4 - f_1 + f_2}{120} \right\}$$

$$\Rightarrow 50 = 50 + \frac{4 - f_1 + f_2}{6} \Rightarrow 0 = \frac{4 - f_1 + f_2}{6}$$

$$\Rightarrow f_1 - f_2 = 4$$

From equation (i) and (ii), we get

$$f_1 + f_2 = 52$$

$$\frac{f_1 - f_2 = 4}{2f_1 = 56}$$

$$\Rightarrow f_1 = 28$$

Putting the value of f_1 in equation (i), we get

$$28 + f_2 = 52 \Rightarrow f_2 = 24$$

Hence, the missing frequencies f_1 is 28 and f_2 is 24.

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

Class interval	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	Total
Frequency	5	X	20	15	y	5	60

Sol. Here, median = 28.5 and n = 60

Now, we have

Class interval	Frequency (f_i)	Cumulative frequency (cf)
0 – 10	5	5
10 – 20	x	5 + x
20 – 30	20	25 + x
30 – 40	15	40 + x
40 – 50	y	40 + x + y
50 – 60	5	45 + x + y
Total	$\Sigma f_i = 60$	

Since the median is given to be 28.5, thus the median is 20 – 30.

$$\therefore \quad \frac{n}{2} = 30, l = 20, h = 10, cf = 5 + x \text{ and } f = 20$$

$$\therefore \quad \text{Median} = l + \left(\frac{\frac{n}{2} - cf}{f} \right) \times h \Rightarrow 28.5 = 20 + \left[\frac{30 - (5 + x)}{20} \right] \times 10$$

$$\Rightarrow \quad 28.5 = 20 + \frac{25 - x}{20} \times 10$$

$$\Rightarrow \quad 28.5 = 20 + \frac{25 - x}{2} \Rightarrow 57 = 40 + 25 - x$$

$$\Rightarrow \quad 57 = 65 - x \Rightarrow x = 65 - 57 = 8$$

$$\text{Also, } n = \Sigma f_i = 60$$

$$\Rightarrow \quad 45 + x + y = 60$$

$$\Rightarrow \quad 45 + 8 + y = 60 \quad [\because x = 8]$$

$$\therefore \quad y = 60 - 53 \Rightarrow y = 7$$

Hence, x = 8 and y = 7.