Missing frequency math using median formula:

problem: An incomplete frequency distribution is given below, where the median is 33.5 and total frequency is 230. Determine the missing frequency by applying median formula.

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	4	16	?	100	?	6	4

Soln:

Class interval	Frequency	Cumulative frequency
0-10	4	4
10-20	16	20
20-30	f_1	$20+f_1$
30-40	100	$120+f_1$
40-50	f_2	$120+f_1+f_2$
50-60	6	$126+f_1+f_2$
60-70	4	$130+f_1+f_2$
	N=230	

Let the missing frequency f_1 and f_2 respectively

Here, $N = 230$

Therefore the equation is

$$130 + f_1 + f_2 = 230$$

$$\Rightarrow f_1 + f_2 = 230 - 130$$

$$\Rightarrow f_1 + f_2 = 100 \quad \text{(i)}$$

We know,

$$\text{Median, } Me = L_1 + \frac{\frac{N}{2} - f_c}{f_m} \times c$$

Here,

$Me = 33.5$

$\frac{N}{2} = \frac{230}{2} = 115$ th Observation

Therefore median class is (30-40)

$$33.5 = 30 + \frac{115 - (20 + f_1)}{100} \times 10$$

$$\Rightarrow 33.5 = 30 + \frac{95 - f_1}{100} \times 10$$

$$\Rightarrow 33.5 - 30 = \frac{95 - f_1}{10}$$

$$\Rightarrow 3.5 = \frac{95 - f_1}{10}$$

$$\Rightarrow f_1 = 95 - 35 = 60$$

Now putting the value of f_1 in equation (i)

$$60 + f_2 = 100$$

$$\Rightarrow f_2 = 100 - 60$$

$$= 40$$

Therefore the missing frequency are 60 and 40

Missing frequency using mode formula

Problem: The mode of the following data is 33.5 and the total frequency is 100. Find the missing frequency x and y.

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	7	12	x	28	y	9

Soln:

Class Interval	Frequency
0-10	7
10-20	12
20-30	x
30-40	28
40-50	y
50-60	9

Mode 33.5 lies in the class 30-40.

30-40 is modal class.

By Mode formula

$$M_0 = L + \frac{\Delta_1}{\Delta_1 + \Delta_2} \times c$$

$$\Rightarrow 33.5 = 30 + \frac{28-x}{(28-x)+(28-y)} \times 10$$

$$\Rightarrow 3.5 = \frac{28-x}{56-x-y} \times 10$$

$$\Rightarrow 280 - 10x = 196 - 3.5x - 3.5y$$

$$\Rightarrow 280 - 196 = 10x - 3.5x - 3.5y$$

$$\Rightarrow 6.5x - 3.5y = 84$$

$$\Rightarrow 65x - 35y = 840 \quad \cdots (1)$$

Total number of observations are 100

$$7 + 12 + x + 28 + y + 9 = 100$$

$$\Rightarrow 56 + x + y = 100$$

$$\Rightarrow x + y = 100 - 56 = 44 \quad \cdots (2)$$

Solving (1) and (2) we get

$$x = 23.8$$

$$y = 20.2$$

H.W From the following data find out the missing frequencies if modal marks of a group of 94 students is 54.

Marks	0-20	20-40	40-60	60-80	80-100
No. of Students	10	a	30	b	14