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