Chapter-statistics

Q1.

Find mode, using an empirical relation, when it is given that mean and median are 10.5 and 9.6 respectively.

Q2.

The following data gives the information on the observed life times (in hours) of 150 electrical components

Life time (in hours)	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
Frequency	15	10	35	50	40

Find the mode of the distribution.

Q3.

Given below is a cumulative frequency distribution of "less than type".

Marks obtained	Less than 20	Less than 30	Less than 40	Less than 50
No. of students cumulative frequency	8	13	19	24

Change the above data into a continuous grouped frequency distribution

Q4.

If the mean of the following distribution is 54, find the missing frequency x:

Class	0–20	20–40	40–60	60–80	80–100
Frequency	16	14	24	26	x

Q5.

Ramesh is a cricket player. He played 50 matches in a year. His data regarding runs scored is given below. Calculate his average score.

Score (runs)	0–20	20–40	40–60	60–80	80–100	100–120
Number of matches	5	11	13	7	8	6

Q6.

Find the median of the following data

Class Interval	5–15	15–25	25–35	35–45	45–55	55–65	65–75
Frequency	6	10	16	15	24	8	7

Q7.

The weights of tea in 70 packets are shown in the following table.

Weight (in gm)	200–201	201–202	202–203	203–204	204–205	205–206
No. of packets	13	27	18	10	1	1

Find the mean weight of packets using step deviation method.

Q8.

In the following frequency distribution, find the median class.

Height (in cm)	104-145	145-150	150-155	155-160	160-165	165-170
Frequency	5	15	25	30	15	10

Q9.

Weekly income of 600 families is given below

Income (in ₹)	Frequency
0–1000	250
1000–2000	190
2000–3000	100
3000–4000	40
4000–5000	15
5000–6000	5

Find the median.

Q10.

Calculate mode of the following data

Marks Obtained	No. of students
0 – 20	8
20 – 40	10
40 – 60	12
60 – 80	6
80 – 100	3

Solution 1.

Mean = 10.5 and median = 9.6

Empirical relation: 3 Median = Mode + 2 Mean

3(9.6) = Mode + 2(10.5)

28.8 = Mode + 21

Mode = 28.8 – 21 = 7.8

Solution 2.

Life time (in hours)	Frequency	
0 – 20	15	
20 – 40	10	
40 – 60	35	
60 – 80	50	⟶ Modal class
80 – 100	40	

Modal class is 60 – 80

$\therefore \quad l = 60, f_0 = 35, f_1 = 50, f_2 = 40, h = 20$

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right)h = 60 + \left[\frac{50 - 35}{(2 \times 50) - 35 - 40}\right] \times 20$$

$$= 60 + \left[\frac{15}{100 - 75}\right] \times 20 = 60 + \left[\frac{300}{25}\right] = 60 + 12 = 72$$

Solution 3.

Class Interval	Number of students (f_i)
10 – 20	8
20 – 30	5
30 – 40	6
40 – 50	5

Solution 4.

Class Interval	x_i	f_i	f_ix_i
0 – 20	10	16	160
20 – 40	30	14	420
40 – 60	50	24	1200
60 – 80	70	26	1820
80 – 100	90	x	$90x$
Total		$80 + x$	$3600 + 90x$

$$\text{Mean} = \frac{\Sigma f_i x_i}{\Sigma f_i} \Rightarrow 54 = \frac{3600 + 90x}{80 + x}$$

$$\Rightarrow \quad 4320 + 54x = 3600 + 90x \Rightarrow 36x = 720 \Rightarrow \boxed{x = 20}$$

Solution 5.

Class Interval	x_i	f_i	f_ix_i
0 – 20	10	5	50
20 – 40	30	11	330
40 – 60	50	13	650
60 – 80	70	7	490
80 – 100	90	8	720
100 – 120	110	6	660
Total		$\Sigma f_i = 50$	$\Sigma f_ix_i = 2900$

$$\text{Mean } (\bar{x}) = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{2900}{50} = 58 \qquad \therefore \text{ Average score of Ramesh} = 58.$$

Solution 6.

Class Interval	f	$c.f.$	
5 – 15	6	6	
15 – 25	10	16	
25 – 35	16	32	
35 – 45	15	47	→Median C.I.
45 – 55	24	71	
55 – 65	8	79	
65 – 75	7	86	
Total	86		

Here, $N = 86, \frac{N}{2} = 43$

$$\text{Median} = l + \left(\frac{\frac{N}{2} - c.f.}{f}\right) \times h = 35 + \left(\frac{43 - 32}{15}\right) \times 10 = 35 + \frac{22}{3} = 42.33$$

Hence, median = 42.33.

Solution 7.

Class Interval	x_i	f_i	$u_i = \frac{x_i - 202.5}{1}$	$f_i u_i$
200 – 201	200.5	13	–2	–26
201 – 202	201.5	27	–1	–27
202 – 203	202.5	18	0	0
203 – 204	203.5	10	1	10
204 – 205	204.5	1	2	2
205 – 206	205.5	1	3	3
Total		$\Sigma f_i = 70$		$\Sigma f_i u_i = -38$

Now, $\bar{u} = \frac{\Sigma f_i u_i}{\Sigma f_i} = \frac{-38}{70}$

$\because \quad \bar{x} = A + h\bar{u}$

$$= 202.5 + 1\left(\frac{-38}{70}\right) = 202.5 - \frac{38}{70} = \frac{14175 - 38}{70} = \frac{14137}{70} = 201.96$$

Solution 8.

We prepare following cumulative frequency table to find median class.

Height	Frequency	c.f.
140-145	5	5
145-150	15	20
150-155	25	45
155-160	30	75
160-165	15	90
165-170	10	100
	$N = 100$	

We have $N = 100$; $\frac{N}{2} = 50$

Cumulative frequency just greater than $\frac{N}{2}$ is 75 and the corresponding class is 155-160. Thus median class is 155-160.

Solution 9.

Income (in ₹)	Number of families (f)	$c.f.$
0 – 1000	250	250
1000 – 2000	190	440
2000 – 3000	100	540
3000 – 4000	40	580
4000 – 5000	15	595
5000 – 6000	5	600

$$N = 600 \Rightarrow \frac{N}{2} = 300$$

$\therefore$ Median class $= 1000 - 2000$

$l = 1000, c.f. = 250, f = 190, h = 1000$

$$\text{Median} = l + \left(\frac{\frac{N}{2} - c.f.}{f}\right) \times h = 1000 + \left(\frac{300 - 250}{190}\right) \times 1000 = 1000 + \frac{5000}{19}$$

$$= 1263.158$$

Solution 10.

Marks obtained	No. of students
0 – 20	8
20 – 40	10
40 – 60	12
60 – 80	6
80 – 100	3

$\because$ Maximum frequency $= 12$

$\therefore$ Modal class $= 40 - 60$

Now, $l = 40, f_0 = 10, f_1 = 12, f_2 = 6, h = 20$

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

$$= 40 + \left(\frac{12 - 10}{2 \times 12 - 10 - 6}\right) \times 20$$

$$= 40 + \frac{2}{8} \times 20 = 45$$