STATISTICS

Main Points :

- For ungrouped data $\text{A.M.} = \dfrac{\text{Sum of observations}}{\text{Number of Observations}}$
- For Grouped data, $\text{A.M.} = A + \left(\dfrac{\Sigma f_i u_i}{N} \times C\right)$
- For Grouped data Medium $L + \dfrac{N/2 - F}{f} \times C$
- For Grouped data Mode $= L + \dfrac{\Delta_1}{\Delta_1 + \Delta_2} \times C$

  Where $\Delta_1 = f - f_1$ $\Delta_2 = f - f_2$
- Emperical relation among Mean, Median and Mode is

  Mean – Mode = 3 (Mean – Median)

  (or)

  Mode = 3 Median – 2 Mean

4 Marks Questions

1. Calculate the Mean for the following data?

C.I.	0-50	50-100	100-150	150-200	200-250	250-300
f	8	15	32	26	12	7

Sol:

C.I.	f	Mid Value (x_i)	$u_i = \dfrac{x_i - A}{C}$	$f_i u_i$
0-50	8	25	–3	– 24
50-100	15	75	–2	– 30
100-150	32	125	–1	– 32
150-200	26	175 (A)	0	0
200-250	12	225	1	12
250-300	7	275	2	14
	N = 100			$\Sigma f_i u_i$ **= –174**

$$A.M. = A + \left(\frac{\Sigma f_i u_i}{N} \times C \right)$$

Hence A = 175, Sfiui = – 60, C = 50, N = 100

$$A.M. = 175 + \left(\frac{-60}{100} \times 50 \right)$$

$$= 175 + \left(\frac{-300}{100} \right)$$

= 175 + (– 3)

= 175 – 3 = 172

2. Calculate the Median for the following data.

Marks	1-10	11-20	21-30	31-40	41-50
No.of Students	3	12	16	14	5

Sol:

Marks	No.of Students	LCF
1-10	3	3
11-20	12	3 + 12 = 15 (F)
21-30	16	15 + 16 = 31
31-40	14	31 + 14 = 45
41-50	5	45 + 5 = 50
	N = 50	

$$\text{Median} = L + \left(\frac{N/2 - F}{f} \times C \right)$$

$\frac{N}{2} = \frac{50}{2} = 25$ lies in 3!

∴ 21 – 30 is the median class.

$L = \frac{20 + 21}{2} = 20.5$ f = 16, F = 15, C= 10

$$\text{Median} = 20.5 + \left(\frac{25 - 15}{16} \times 10 \right)$$

$= 20.5 + \left(\frac{10 \times 10}{16}\right)$

$= 20.5 + \frac{100}{16}$

20.5 + 6.25 = 26.75 Marks

3. Calculate Mode for the following Data?

Marks	0-5	5-10	10-15	15-20	20-25
No.of Students	10	18	42	23	7

Sol:

Marks	No.of Students
0-5	10
5-10	18 (f_1)
10-15	42 (f)
15-20	23 (f_2)
20-25	23

Mode $= L + \frac{\Delta_1}{\Delta_1 + \Delta_2} \times C$

Where $\Delta_1 = f - f_1$

$\Delta_2 = f - f_2$

Here highest frequency is 42

Hence 10 – 15 is the modal Class

f = 42, f_1 = 18, f_2 = 23, C = 5

$\Delta_1 = 42 - 18 = 24$

$\Delta_2 = 42 - 23 = 19$

$L = \frac{10 + 10}{2} = 10$

Mode $= 10 + \left(\frac{24}{24 + 19} \times 5\right)$

$= 10 + \frac{120}{43}$

= 10 + 2.79

= 12.79 Marks

2 Marks Questions

1. The mean of marks secured by 50 student is 80. On verification of data it was found that the marks of one student were shown as 73 instead of 37. If corrected, find the new mean.

Sol: Mean = 80

No. of Student = 50

$$\text{Mean} = \frac{\text{Sum of observations}}{\text{Number of Observations}}$$

$$80 = \frac{\text{Sum of observations}}{50}$$

Sum of observations = 80 × 50 = 4000

Marks of one student were shown as 73 instead of 37

$$\text{Correct Mean} = \frac{\text{Correct Sum of observations}}{\text{Correct No.of Observations}}$$

$$= \frac{4000 - 73 + 37}{50}$$

$$= \frac{3964}{50} \times \frac{2}{2}$$

$$= \frac{7928}{100}$$

= 79.28 Marks

2. The mean of 11 observations is 17.5. one observation 15 is deleted. Find the mean of remaining observations.

Sol: Number of Observations = 11

Mean = 17.5

$$\text{Mean} = \frac{\text{Sum of observations}}{\text{Number of Observations}}$$

$$17.5 = \frac{\text{Sum of observations}}{11}$$

Sum of Observations = 17.5 × 11 = 192.5

An observation 15 is deleted.

$$\text{Mean of remaining observations} = \frac{\text{Sum of remaining observations}}{\text{No.of remaining Observations}}$$

$$= \frac{192.5 - 15}{11 - 1}$$

$$= \frac{177.5}{10} = 17.75$$

3. The Observations of an ungrouped data are x_1, x_2, x_3 where $x_1 < x_2 < 2x_1$ of the mean and median of the data are each equals to 6, find the observations of the data.

Sol: The observations are x_1, x_2, $2x_1$, Where $x_1 < x_2 < 2x_1$

Mean = 6

Median = 6

$$\text{Mean} = \frac{\text{Sum of observations}}{\text{Number of Observations}}$$

$$6 = \frac{x_1 + x_2 + 2x_1}{3}$$

$6 \times 3 = 3x_1 + 6$

$18 = 3x_1 + 6$

$18 - 6 = 3x_1$

$12 = 3x_1$

$x_1 = 4$

$2x_1 = 2 \times 4 = 8$

$\therefore$ The required observations are 4, 6, 8

4. The observation of an ungrouped data are x_1, x_2 and x_3, where $x_1 < x_2 < x_3$. If the mean and median of the data are 30 and 20 respectively and also x3 – x1 = 50, find x_1, x_2 and x_3.

Sol: The observations are x_1, x_2, x_3, $x_1 < x_2 < x_3$

Median $x_2 \Rightarrow$ Median = 20

$\Rightarrow x_2 = 20$

Mean = 30

$$\frac{x_1 + x_2 + x_3}{3} = 30$$

$$\frac{x_1 + 20 + x_3}{3} = 30$$

$x_1 + x_3 = 90 - 20$

$x_1 + x_3 = 70$ .....(1)

Given that $x_3 - x_1 = 50$

$$\begin{array}{r} x_1 + x_3 = 70 \\ x_3 - x_1 = 50 \\ \hline 2x_3 = 120 \end{array}$$

$x_3 = 60$

substitute x_3 in (1)

$x_1 + 60 = 70$

$\Rightarrow x_1 = 70 - 60$

$x_1 = 10$

$\Rightarrow$ Required observations are 10, 20, 60

4. The mean and median of a unimodal grouped data are 72.5 and 73.9 respectively. Find the mode of the data.

Sol: Mean = 72.5

Median = 73.9

Mode = 3 Median – 2 Mean

= 3(73.9) – 2 (72.5)

= 221.7 – 145

= 76.7

1 Mark Questions

1. Write the Merits of A.M.?

A. Merits of A.M.:

1. It is uniquely defined i.e. it has one and only one value
2. It is based on all the observation
3. It is easily understood
4. It is easy to compute

2. Find the mean of $\frac{1}{3}, \frac{3}{4}, \frac{5}{6}, \frac{1}{2}, \frac{7}{12}$

A. $$\text{Mean} = \frac{\text{Sum of observations}}{\text{Number of Observations}}$$

$$\frac{\frac{1}{3}+\frac{3}{4}+\frac{5}{6}+\frac{1}{2}+\frac{7}{12}}{5}$$

$$\frac{\frac{4+9+10+6+7}{12}}{5}$$

$$\frac{\frac{1}{3}+\frac{3}{4}+\frac{5}{6}+\frac{1}{2}+\frac{7}{12}}{5}$$

$$\frac{\cancel{36}^{3}}{\cancel{12}_{1}\times 5} = \frac{3}{5}$$

3. Write the Properties of Mode?

A. **Properties of Mode:**

1. For a data mode may exists or may not
2. If mode exists, for a data it may not be unique.
3. Data having one modes is uni-modal
4. Data having 2 modes is bi-modal
5. Data having 3 modes is tri-modal
6. Date having more than 3 modes is poly-modal.

4. For a given data Mean = 39, Median = 38. Find Mode.

A. Mean = 39. Median = 38

Mode = 3 median – 2 Mean

= 3 (38) – 2 (39)

= 114 – 78

= 36

5. Find the median of $\frac{3}{4}, \frac{1}{2}, \frac{2}{3}, \frac{1}{6}, \frac{7}{12}$

A. $\frac{3}{4}, \frac{1}{2}, \frac{2}{3}, \frac{1}{6}, \frac{7}{12}$

LCM of denomination is 12

$\Rightarrow \frac{3}{4}\times\frac{3}{3}, \frac{1}{2}\times\frac{6}{6}, \frac{2}{3}\times\frac{4}{4}, \frac{1}{6}\times\frac{2}{2}, \frac{7}{12}\times\frac{1}{1}$

$\Rightarrow \frac{9}{12}, \frac{6}{12}, \frac{8}{12}, \frac{2}{12}, \frac{7}{12}$

A.O $\rightarrow \frac{2}{12}, \frac{6}{12}, \boxed{\frac{7}{12}}, \frac{8}{12}, \frac{9}{12}$

Here Median = $\frac{7}{12}$

Multiple Choice Questions

1. The class interval of 1-10 is

a) 10 b) 9 c) 9.5 d) None

2. Range of 20, 18, 42, 3, 12, 15, 10 is

a) 63 b) 42 c) 39 d) 6

3. Histogram consists of

a) Rectangle b) Sectors c) triangles d) Squares

4. Mid Value of 1-10 is

a) 5 b) 5.5 c) 6 d) 6.5

5. The mean of 12, 15, x, 19, 25, 44 is 25 then x =

a) 20 b) 25 c) 30 d) 35

6. The A.M. of a–2, a and a+2 is

a) a b) – a c) 1/a d) – 1/a

7. Mid-values of classes are used in the calculation of

a) Mean b) Median c) Mode d) None

8. Cumulative frequencies are used in the calculation of

a) Mean b) Median c) Mode d) None

9. The Median of $\frac{x}{3}, \frac{x}{2}, \frac{x}{4}, \frac{2x}{9}, x$ $(x > 0)$ is 5 then x =

a) 10 b) 20 c) 15 d) 25

10. If A.M. is 32, Median is 29 then Mode of the data is

a) 29.5 b) 30 c) 30.5 d) 23

11. Formula for grouped data of median is

a) $L + \left(\frac{\frac{N}{2} - F}{f} \times C \right)$ b) $L + \left(\frac{\frac{N}{2} - C}{f} \times F \right)$

c) $L + \left(\frac{\frac{N}{2} - f}{F} \times C \right)$ d) None

12. One relation among mean, median and mode is

a) Mean – Median = 3 (Mean + Mode)
b) Mode = 3 Mean – 2 Median
c) Mode = 3 Median – 2 Mean
d) Mode = 2 Median – 3 Mean

13. Mode of 2, 3, 7, 8, 9

a) 2 b) 9 c) 7 d) Doesn't exists

14. The mean of 10 observations is 7 and the mean of 15 observations is 12 then the mean of all observations is

a) 7 b) 12 c) 10 d) 15

15. Formula for the mean of an ungrouped data is

a) Σnx b) $\Sigma x/n$ c) $\Sigma x/n^2$ d) $\Sigma n^2 x$

KEY:

1) a	2) c	3) a	4) b	5) d	6) a	7) a	8) d
9) c	10) d	11) a	12) c	13) d	14) c	15) b	

Fill in the blanks

1. The sum of first 100 natural numbers is _____
2. A.M. of first 100 natural numbers is _____
3. The mean of 9, 11, 3, P, 18, 19 is p then P = _____
4. Midvalue of 10-19 is _____
5. The sum of 15 observations is 120 then mean = _____
6. In the Mode formula Δ_2 =
7. Median of – 3, – 5, – 8, 0, 3, 2, – 10 is _____
8. If median = 125.6, Mean = 128 then mode = _____
9. If 1-10, 11-20, 21-30, ... are the classes there for a class 11-20, then Lower limit is _____
10. The greater then cumulative frequency of a class is 83 and that of the next class is 72 then the frequency of that class is _____

KEY:

1) 5050 2) 50.5 3) 14 4) 14.5 5) 8 6) $f - f_2$ 7) – 3 8) 120.8
9) 11 10. 11