BIOSTATISTICS- WORKED OUT EXAMPLES

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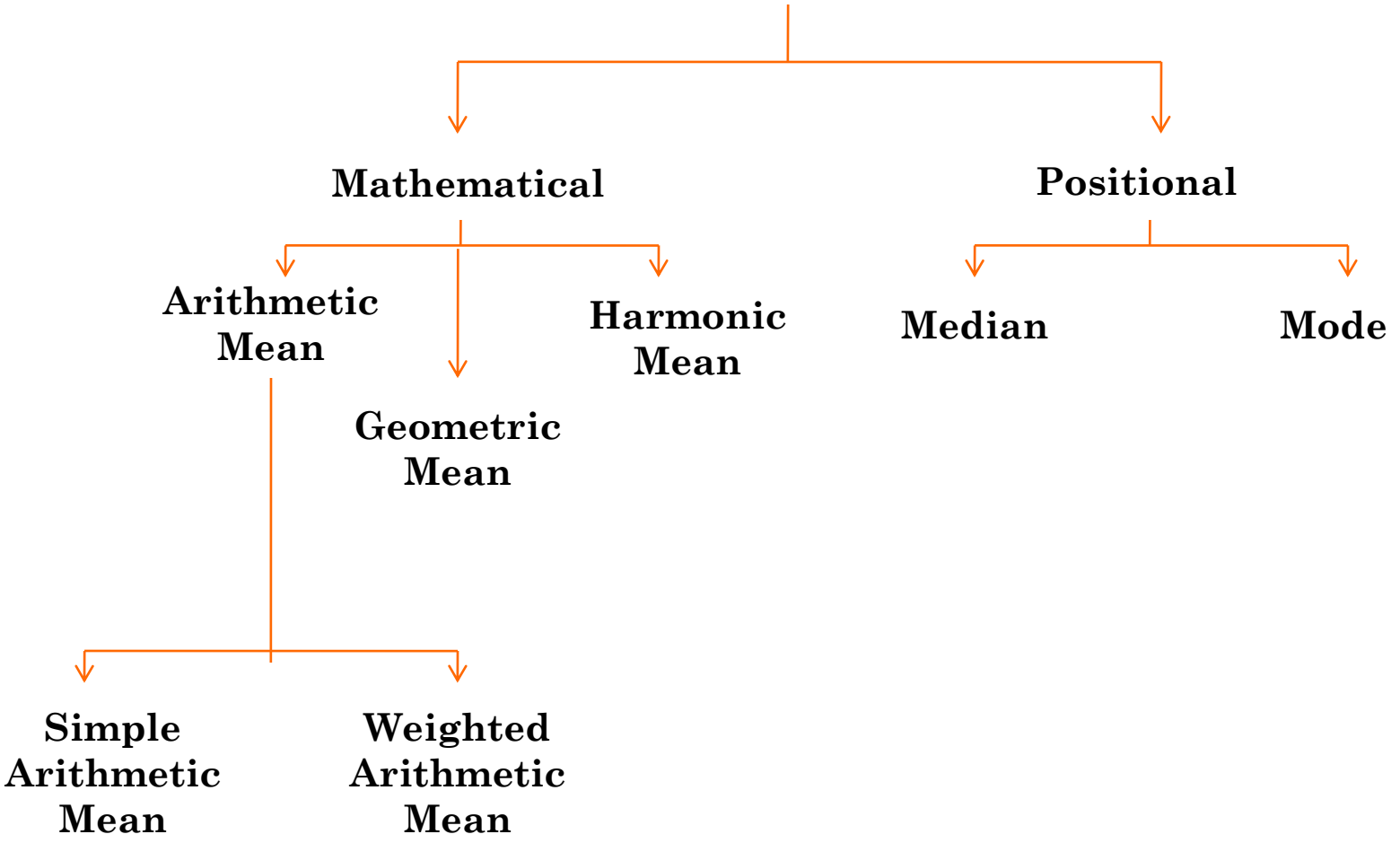
Measures of Central Tendency



Geometric Mean

What is Geometric Mean?

- It is the nth root of the product of n values.
- GM = $\sqrt[n]{x_1 . x_2 x_3 \ldots\ldots\ldots x_n}$

- The formula for calculation of Geometric Mean is:
- GM = $Antilog[\frac{1}{n} \cdot \Sigma Log x]$

- **Example**:
- Daily incomes of ten workers are given below. Calculate the geometric mean.
- Income (Rs.) 40 45 75 70 85 500 250 36 8 15

x	Log x
40	1.60206
45	1.653213
75	1.875061
70	1.845098
85	1.929419
500	2.69897
250	2.39794
36	1.556303
8	0.90309
15	1.176091

n = 10 $\cdot\Sigma Logx$ = 17.6373

GM = $Antilog[\frac{1}{n}\cdot\Sigma Logx]$

= Antilog [(1/10). 17.6373]

= **1.7637**

HARMONIC MEAN

- Harmonic mean (HM) of n values is the reciprocal of the mean of the reciprocals of the values. It is given by the equation.

- HM = $Reciprocal[\frac{\Sigma reciprocals}{n}]$

(or)

HM = $[\frac{n}{\Sigma reciprocals}]$

Calculation of Harmonic mean

Example: Calculate the Harmonic Mean for the following values

X: 18 12 16 21 7 9

X	Reciprocals(1/x)
18	0.0556
12	0.0833
16	0.0625
21	0.0476
7	0.1429
9	0.1111

n = 6 $\Sigma(\frac{1}{x})$ = 0.5030

HM = $[\frac{n}{\Sigma reciprocals}]$

HM = 6/ 0.5030

= **11.929**

Weighted Arithmetic Mean

- Weighted arithmetic mean is defined as the calculation of arithmetic mean by equating the weights to different items in a series according to their relative importance.
- It is given by:
- Weighted mean, $\bar{X}_w = \left(\frac{\Sigma W X}{\Sigma W}\right)$

Calculation of Weighted Arithmetic mean

Calculate the weighted arithmetic mean from the following distribution

Size (X)	10	20	25	15	20
Weight (W)	2	5	1	7	6

X	W	WX
10	2	20
20	5	100
25	1	25
15	7	105
20	6	120

$\Sigma W = 21$ $\Sigma WX = 370$

$$\left(\frac{\Sigma WX}{\Sigma W}\right) = 370/21$$

$$= \underline{17.619}$$

Measures of dispersion

- Range
- Inter-quartile range (or Quartile range)
- Mean deviation
- Variance and Coefficient of variance
- Standard deviation

QUARTILE DEVIATION

- The inter-quartile range or quartile deviation of a group of observations is the interval between the values of the upper quartile and the lower quartile for that group. If lower quartile is Q1 and the upper quartile is Q3 then:

- Interquartile range = Q3 – Q1

- Semi-Interquartile range = $\frac{1}{2}[Q3 - Q1]$

- Coefficient of Semi-Interquartile range = $\frac{Q3 - Q1}{Q3 + Q1}$

Calculation of Quartile deviation

- Calculate the inter quartile range, quartile deviation and coefficient of quartile deviation, for the following data

Height	58	59	60	61	62	63	64	65	66
No. of students	21	25	28	18	20	22	24	23	18

Height	Frequency	Cumulative frequency
58	21	21
59	25	46
60	28	74
61	18	92
62	20	112
63	22	134
64	24	158
65	23	181
66	18	199
	N= 199	

Size of Q1 = $Sizeof[\frac{N+1}{4}]^{th} item$ = **50^{th} item**

Size of Q3 = $Sizeof[\frac{3(N+1)}{4}]^{th} item$ = **150^{th} item**

Therefore, Q1 = 60
Q3 = 64

Interquartile Range	=	Q3-Q1 =	4
Semi-IQR	=	1/2(Q3-Q1)=	2
Coefficient of QD	=	(Q3-Q1)/(Q3+Q1)	**0.0323**

Mean Deviation

- **Mean deviation (MD)** is defined as an average or mean of the deviations of the values from the central tendency (i. e mean, median, or mode)
- Mean Deviation (MD) = $\frac{\Sigma|dx|}{N}$
- MD for frequency distribution = $\frac{\Sigma f(x-\bar{x})}{N}$
- Coefficient of Mean deviation = $\frac{MD}{Mean}$

CALCULATION OF MEAN DEVIATION

- Find the mean deviation from the following data:

10, 20, 26, 32, 23, 15

Sl. No.	x	dx = x- $\bar{x}$	|dx|
1	10	-11	11
2	20	-1	1
3	26	5	5
4	32	11	11
5	23	2	2
6	15	-6	6

$\sum x$ =126 $\Sigma|dx|$=36

Mean = $\frac{\sum x}{n}$ = 126/6 = **21**

Mean deviation = $\frac{\Sigma|dx|}{N}$ = 36/6= **6**

Coefficient of Mean deviation = $\frac{MD}{Mean}$

= 6/21

= **0.285**

Thank you. .