

# GEOMETRIUC AND HARMONIC MEAN

# GEOMETRIC MEAN

- ▶ Geometric mean (GM) is another measure of central tendency.
- ▶ A geometric mean is a average which shows the central tendency of a set of numbers by using the product of their values.
- ▶ For a set of n observations, a geometric mean is the nth root of their product. The geometric mean G.M., for a set of numbers  $x_1, x_2, \dots, x_n$  is given as
- ▶ 
$$\text{G.M.} = (x_1 \cdot x_2 \dots x_n)^{1/n}$$
$$= \sqrt[n]{x_1, x_2, \dots, x_n}.$$

# Advantages of Geometric Mean

- A geometric mean is based upon all the observations
- It is rigidly defined
- The fluctuations of the observations do not affect the geometric mean
- It gives more weight to small items

# Disadvantages of Geometric Mean

- A geometric mean is not easily understandable by a non-mathematical person
- If any of the observations is zero, the geometric mean becomes zero
- If any of the observation is negative, the geometric mean becomes imaginary

# HARMONIC MEAN

- ▶ Harmonic mean is another measure of central tendency
- ▶ It is the reciprocal of the arithmetic mean of the reciprocals of the observations.
- ▶  $H.M. = 1 \div \left( \frac{1}{n} \sum_{i=1}^n \left( \frac{1}{x_i} \right) \right)$

# Advantages of Harmonic Mean

- A harmonic mean is rigidly defined
- It is based upon all the observations
- The fluctuations of the observations do not affect the harmonic mean
- More weight is given to smaller items

# Disadvantages of Harmonic Mean

- Not easily understandable
- Difficult to compute

# RELATIONSHIP OF AM, GM AND HM

- ▶ The formula for the relation between AM, GM, HM is the product of arithmetic mean and harmonic mean is equal to the square of the geometric mean.
- ▶  **$AM \times HM = GM^2$ .**



Find the harmonic mean of two numbers a and b, if their arithmetic mean is 16 and geometric mean is 8

► Given: AM = 16 and GM = 8

$$\mathbf{AM \times HM = GM^2.}$$

$$= 16 \times HM = 8^2$$

$$= 16 \times HM = 64$$

$$= HM = 64/16$$

$$= 4$$