Arithmetic Mean

Ungrouped Data

$$\bar{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$

$$\bar{X} = A + \frac{\sum_{i=1}^{n} D_i}{n}$$

$$\because D_i = X_i - A$$

Grouped Data

$$\bar{X} = \frac{\sum_{i=1}^{n} f_i X_i}{\sum_{i=1}^{n} f_i}$$

$$\bar{X} = A + \frac{\sum_{i=1}^{n} f_i D_i}{\sum_{i=1}^{n} f_i}$$

$$\because D_i = X_i - A$$

For Equal Class Interval h

$$\bar{X} = A + \frac{\sum_{i=1}^{n} f_i u_i}{\sum_{i=1}^{n} f_i} \times h$$

$$u_i = \frac{X_i - A}{h}$$

Weighted Arithmetic Mean

$$\bar{X}_w = \frac{\sum_{i=1}^{n} w_i X_i}{\sum_{i=1}^{n} f_i}$$

Combined Arithmetic Mean

$$\bar{X}_c = \frac{n_1\bar{X}_1 + n_2\bar{X}_2 + n_3\bar{X}_3 + \cdots + n_k\bar{X}_k}{n_1 + n_2 + n_3 + \cdots + n_k} = \frac{\sum_{i=1}^{k} n_i \bar{X}_i}{\sum_{i=1}^{k} n_i}$$

Geometric Mean

Ungrouped Data

$$\mathrm{G.M} = \sqrt[n]{X_1 \times X_2 \times X_3 \times \ldots \times X_n} = \sqrt[n]{\prod_{i=1}^{n} X_i}$$

$$\mathrm{G.M} = \text{Anti-}\log\left(\frac{\sum_{i=1}^{n} \log x_i}{n}\right)$$

Grouped Data

$$\mathrm{G.M} = \sqrt[\sum_{i=1}^{n} f_i]{(X_1)^{f_1} \times (X_2)^{f_2} \times (X_3)^{f_3} \times \ldots \times (X_n)^{f_n}} = \sqrt[\sum_{i=1}^{n} f_i]{\prod_{i=1}^{n} (X_i)^{f_i}}$$

$$\mathrm{G.M} = \text{Anti} - \log\left(\frac{\sum_{i=1}^{n} f_i \log X_i}{\sum_{i=1}^{n} f_i}\right)$$

Combined Geometric Mean

$$\mathrm{G.M}_{\mathrm{com}} = \frac{n_1 \log G_1 + n_2 \log G_2 + n_3 \log G_3 + \cdots + n_k \log G_k}{n_1 + n_2 + n_3 + \cdots + n_k} = \frac{\sum_{i=1}^{k} n_i \log G_i}{\sum_{i=1}^{n} n_i}$$

For equal sample size n

$$\mathrm{G} = \frac{\mathrm{G}_1}{\mathrm{G}_2}$$

Hormonic Mean

Ungrouped Data

$$\mathrm{H.M} = \frac{n}{\sum_{i=1}^{n}\left(\frac{1}{X_i}\right)}$$

Grouped Data

$$\mathrm{H.M} = \frac{\sum_{i=1}^{n} f_i}{\sum_{i=1}^{n} f_i\left(\frac{1}{X_i}\right)}$$

Combined Hormonic Mean

$$\mathrm{H.M_{comb}} = \frac{n_1 + n_2 + n_3 + \cdots + n_k}{\frac{n_1}{H_1} + \frac{n_2}{H_2} + \frac{n_3}{H_3} + \cdots + \frac{n_k}{H_k}} = \frac{\sum_{i=1}^{k} n_i}{\sum_{i=1}^{k} \frac{n_i}{H_i}}$$

General Relationship Between Arithmetic Mean, Geometric Mean and Hormonic Mean

$$\mathrm{A.M} \geq \mathrm{G.M} \geq \mathrm{H.M}$$