



GEOMETRIC MEAN

Geometric mean

The geometric mean of a series containing n observations is the n th root of the product of the values.

If x_1, x_2, \dots, x_n are observations then

$$\begin{aligned} \text{G.M} &= \sqrt[n]{x_1, x_2, \dots, x_n} \\ &= (x_1, x_2, \dots, x_n)^{1/n} \end{aligned}$$

$$\begin{aligned} \text{Log GM} &= \frac{1}{n} \log (x_1, x_2, \dots, x_n) \\ &= \frac{1}{n} (\log x_1 + \log x_2 + \dots + \log x_n) \\ &= \frac{\sum \log x_i}{n} \end{aligned}$$

$$\text{GM} = \text{Antilog} \frac{\sum \log x_i}{n}$$

For grouped data

$$\text{GM} = \text{Antilog} \left[\frac{\sum f \log x_i}{n} \right]$$

GM is used in studies like bacterial growth, cell division, etc.

If the weights of sorghum ear heads are 45, 60, 48, 100, 65 gms. Find the Geometric mean for the following data

Weight of ear head x (g)	Log x
45	1.653
60	1.778
48	1.681
100	2.000
65	1.813
Total	8.925

Solution

Here $n = 5$

$$\begin{aligned} \text{GM} &= \text{Antilog } \frac{\sum \log x_i}{n} \\ &= \text{Antilog } \frac{8.925}{5} \\ &= \text{Antilog } 1.785 \\ &= 60.95 \end{aligned}$$

Grouped Data

Find the Geometric mean for the following

Weight of sorghum (x)	No. of ear head(f)
50	4
65	6
75	16
80	8
95	7
100	4

Solution will be like this

Weight of sorghum (x)	No. of ear head(f)	Log x	f x log x
50	5	1.699	8.495
63	10	10.799	17.99
65	5	1.813	9.065
130	15	2.114	31.71
135	15	2.130	31.95
Total	50	9.555	99.21

Here n= 50

$$GM = \text{Antilog} \left[\frac{\sum f \log x_i}{n} \right]$$

$$= \text{Antilog} \left[\frac{99.21}{50} \right]$$

$$= \text{Antilog } 1.9842 = 96.43$$

Continuous distribution

For the frequency distribution of weights of sorghum ear-heads given in table below, Calculate the Geometric mean

Weights of ear heads (in g)	No of ear heads (f)
60-80	22
80-100	38
100-120	45
120-140	35
140-160	20
Total	160

Solution

Weights of ear heads (in g)	No of ear heads (f)	Mid x	Log x	f log x
60-80	22	70	1.845	40.59
80-100	38	90	1.954	74.25
100-120	45	110	2.041	91.85
120-140	35	130	2.114	73.99
140-160	20	150	2.176	43.52
Total	160			324.2

Here $n = 160$

$$GM = \text{Antilog} \left[\frac{\sum f \log x_i}{n} \right]$$

$$= \text{Antilog} \left[\frac{324.2}{160} \right]$$

$$= \text{Antilog} [2.02625]$$

$$= 106.23$$

- <https://www.youtube.com/watch?v=rLgeJxeVa7c>