

# W Mean

## Mean

*Arithmetic-geometric mean Arithmetic-harmonic mean Cesàro mean Chisini mean Contraharmonic mean Elementary symmetric mean Geometric-harmonic mean Grand mean Heinz mean Heronian*

A mean is a quantity representing the "center" of a collection of numbers and is intermediate to the extreme values of the set of numbers. There are several kinds of means (or "measures of central tendency") in mathematics, especially in statistics. Each attempts to summarize or typify a given group of data, illustrating the magnitude and sign of the data set. Which of these measures is most illuminating depends on what is being measured, and on context and purpose.

The arithmetic mean, also known as "arithmetic average", is the sum of the values divided by the number of values. The arithmetic mean of a set of numbers  $x_1, x_2, \dots, x_n$  is typically denoted using an overhead bar,

$x$

—

$\{\displaystyle {\bar {x}}\}$

. If the numbers are from observing a sample of a larger group, the arithmetic mean is termed the sample mean (

$x$

—

$\{\displaystyle {\bar {x}}\}$

) to distinguish it from the group mean (or expected value) of the underlying distribution, denoted

?

$\{\displaystyle \mu \}$

or

?

$x$

$\{\displaystyle \mu _{x}\}$

.

Outside probability and statistics, a wide range of other notions of mean are often used in geometry and mathematical analysis; examples are given below.

Mean value theorem

*In mathematics, the mean value theorem (or Lagrange's mean value theorem) states, roughly, that for a given planar arc between two endpoints, there is*

In mathematics, the mean value theorem (or Lagrange's mean value theorem) states, roughly, that for a given planar arc between two endpoints, there is at least one point at which the tangent to the arc is parallel to the secant through its endpoints. It is one of the most important results in real analysis. This theorem is used to prove statements about a function on an interval starting from local hypotheses about derivatives at points of the interval.

A-side and B-side

*October 2013. "The Straight Dope: In the record business, what do "b/w" and "c/w" mean?" 15 October 1999. Archived from the original on 4 October 2008.*

The A-side and B-side are the two sides of vinyl records and cassettes, and the terms have often been printed on the labels of two-sided music recordings. The A-side of a single usually features a recording that its artist, producer, or record company intends to be the initial focus of promotional efforts and radio airplay, with the aim of it becoming a hit record. The B-side (or "flip-side") is a secondary recording that typically receives less attention, although some B-sides have been as successful as, or more so than, their A-sides.

Use of this language has largely declined in the 21st century as the music industry has transitioned away from analog recordings towards digital formats without physical sides, such as downloads and streaming. Nevertheless, some artists and labels continue to employ the terms A-side and B-side metaphorically to describe the type of content a particular release features, with B-side sometimes representing a "bonus" track or other material.

Weighted geometric mean

$\frac{1}{n} \sum_{i=1}^n w_i \ln x_i$  *The second form above illustrates that the logarithm of the geometric mean is the weighted*

In statistics, the weighted geometric mean is a generalization of the geometric mean using the weighted arithmetic mean.

Given a sample

$x_1, x_2, \dots, x_n$

x

n

)

$$\{\text{displaystyle } x=(x_{\{1\}},x_{\{2\}}\backslash\text{dots } ,x_{\{n\}})\}$$

and weights

w

=

(

w

1

,

w

2

,

...

,

w

n

)

$$\{\text{displaystyle } w=(w_{\{1\}},w_{\{2\}},\backslash\text{dots } ,w_{\{n\}})\}$$

, it is calculated as:

x

—

=

(

?

i

=

1

n

x

i

w

i

)

1

/

?

i

=

1

n

w

i

=

exp

?

(

?

i

=

1

n

w

i

ln

?

x

i  
?  
i  
=  
1  
n  
w  
i  
)

$$\{\displaystyle {\bar {x}}=\left(\prod _{i=1}^nx_{i}^{w_{i}}\right)^{1/\sum _{i=1}^nw_{i}}=\quad \exp \left({\frac {\sum _{i=1}^nw_{i}\ln x_{i}}{\sum _{i=1}^nw_{i}}}\right)}$$

The second form above illustrates that the logarithm of the geometric mean is the weighted arithmetic mean of the logarithms of the individual values.

If all the weights are equal, the weighted geometric mean simplifies to the ordinary unweighted geometric mean.

Mean Mary

*Retrieved 2018-01-29. "Tickets | Jane Siberry w/ Mean Mary". The Triple Door. Retrieved 2018-01-29. "vindy.com | Mean Mary grows a following with Trumbull tractor*

Mary James (born March 22, 1980), known by the stage name Mean Mary, is an American singer-songwriter, multi-instrumentalist, novelist, producer and YouTube personality. She has been described as having “the unique ability to mix together a variety of musical styles, which can appeal to a wide audience” and her childhood has been described as “a nomadic life that could have been plucked from an adventure novel.”

Lehmer mean

*Lehmer mean with respect to a tuple  $w$  of positive weights is defined as:  $L_{p,w}(x)=\frac{1}{n}\sum_{k=1}^nw_kx_k^p=\frac{1}{n}\sum_{k=1}^nw_kx_k$*

In mathematics, the Lehmer mean of a tuple

x

$$\{x\}$$

of positive real numbers, named after Derrick Henry Lehmer, is defined as:

L  
p  
(

x

)

=

?

k

=

1

n

x

k

p

?

k

=

1

n

x

k

p

?

1

.

$$\{ \displaystyle L_{\{p\}}(\mathbf{x}) = \frac{\sum_{k=1}^n x_k^p}{\sum_{k=1}^n x_k^{p-1}} \}$$

The weighted Lehmer mean with respect to a tuple

w

$$\{ \displaystyle w \}$$

of positive weights is defined as:

L

p  
,  
w  
(  
x  
)  
=  
?  
k  
=  
1  
n  
w  
k  
?  
x  
k  
p  
?  
k  
=  
1  
n  
w  
k  
?  
x  
k  
p

?

1

.

$$L_{p,w}(\mathbf{x}) = \frac{\sum_{k=1}^n w_k \cdot x_k^p}{\sum_{k=1}^n w_k \cdot x_k^{p-1}}$$

The Lehmer mean is an alternative to power means

for interpolating between minimum and maximum via arithmetic mean and harmonic mean.

Generalized mean

$$\text{mean as } M_p(x_1, \dots, x_n) = \left( \frac{1}{n} \sum_{i=1}^n x_i^p \right)^{1/p}$$

In mathematics, generalized means (or power mean or Hölder mean from Otto Hölder) are a family of functions for aggregating sets of numbers. These include as special cases the Pythagorean means (arithmetic, geometric, and harmonic means).

Weighted arithmetic mean

*The weighted arithmetic mean is similar to an ordinary arithmetic mean (the most common type of average), except that instead of each of the data points*

The weighted arithmetic mean is similar to an ordinary arithmetic mean (the most common type of average), except that instead of each of the data points contributing equally to the final average, some data points contribute more than others. The notion of weighted mean plays a role in descriptive statistics and also occurs in a more general form in several other areas of mathematics.

If all the weights are equal, then the weighted mean is the same as the arithmetic mean. While weighted means generally behave in a similar fashion to arithmetic means, they do have a few counterintuitive properties, as captured for instance in Simpson's paradox.

Harmonic mean

*arguments. The harmonic mean is the reciprocal of the arithmetic mean of the reciprocals of the numbers, that is, the generalized f-mean with  $f(x) = 1/x$*

In mathematics, the harmonic mean is a kind of average, one of the Pythagorean means.

It is the most appropriate average for ratios and rates such as speeds, and is normally only used for positive arguments.

The harmonic mean is the reciprocal of the arithmetic mean of the reciprocals of the numbers, that is, the generalized f-mean with

f

(

x



)

=

1

x

$$f(x)=\frac{1}{x}$$

. For example, the harmonic mean of 1, 4, and 4 is

(

1

?

1

+

4

?

1

+

4

?

1

3

)

?

1

=

3

1

1

+

1

4

+

1

4

=

3

1.5

=

2

.

$$\left(\frac{1^{-1}+4^{-1}+4^{-1}}{3}\right)^{-1}=\frac{3}{\left\{\frac{1}{1}\right\}+\left\{\frac{1}{4}\right\}+\left\{\frac{1}{4}\right\}}=\frac{3}{1.5}=2\,.$$

Mu (letter)

Eric W. "Mean". *mathworld.wolfram.com*. Retrieved 2025-01-24. *M/M/1 queues and queueing networks*, Oxford University lecture notes Weisstein, Eric W. "Soldner's

Mu ( ; uppercase ?, lowercase ?; Ancient Greek ?? [m??], Greek: ?? or ??—both [mi]) is the twelfth letter of the Greek alphabet, representing the voiced bilabial nasal IPA: [m]. In the system of Greek numerals it has a value of 40. Mu was derived from the Egyptian hieroglyphic symbol for water, which had been simplified by the Phoenicians and named after their word for water, to become ? img (mem). Letters that derive from mu include the Roman M and the Cyrillic ?, though the lowercase resembles a small Latin U (u).

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