

What is the difference between Expected Value and Mean?

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Expected value and mean are two statistical measures used to describe the central tendency of a set of data. The main difference between the two is that expected value takes into account the probability of each data point occurring, whereas the mean only considers the actual values of the data.

Expected value, also known as the mathematical expectation, is a weighted average of all possible outcomes, with each outcome being multiplied by its respective probability. This is often used in scenarios where there is uncertainty or randomness, such as in gambling or financial investments. It provides a more accurate representation of the true average of the data, taking into account the likelihood of each outcome.

On the other hand, mean, also known as the arithmetic average, is simply the sum of all values in a data set divided by the number of values. It is a useful measure for determining the typical value of a set of data, but it does not consider the probability of each value occurring.

In summary, the main difference between expected value and mean is that expected value is a more comprehensive measure that considers the probability of each data point, while mean is a simple average of the data. Both measures have their own uses and can provide valuable insights, depending on the nature of the data being analyzed.

Expected Value vs. Mean: What's the Difference?

Two terms that are sometimes used interchangeably in statistics are expected value and mean.

In general, we use the following terms in different situations:

Expected value is used when we want to calculate the mean of a probability distribution. This represents the average value we expect to occur before collecting any data. Mean is typically used when we want to calculate the average value of a given sample. This represents

the average value of raw data that we've already collected.

The following examples illustrate how to calculate the expected value and the mean in practice.

Example: Calculating Expected Value

A probability distribution tells us the probability that a takes on certain values.

For example, the following probability distribution tells us the probability that a certain soccer team scores a certain number of goals in a given game:

Goals (X)	Probability P(X)
0	0.18
1	0.34
2	0.35
3	0.11
4	0.02

To calculate the expected value of this probability distribution, we can use the following formula:

$$\text{Expected Value} = \sum x * P(x)$$

where:

x: Data value P(x): Probability of value

For example, we would calculate the expected value for this probability distribution to be:

Expected Value = $0 \cdot 0.18 + 1 \cdot 0.34 + 2 \cdot 0.35 + 3 \cdot 0.11 + 4 \cdot 0.02 = 1.45$ goals.

This represents the expected number of goals that the team will score in any given game.

Example: Calculating Mean

We typically calculate the mean after we've actually collected raw data.

Goals Scored: 1, 1, 0, 2, 2, 1, 0, 3, 1, 1, 1, 2, 4, 3, 1

To calculate the mean number of goals scored per game, we can use the following formula:

$$\text{Mean} = \frac{\sum x_i}{n}$$

where:

x_i : Raw data values n : Sample size

For example, we would calculate the mean number of goals scored as:

Mean = $(1+1+0+2+2+1+0+3+1+1+1+2+4+3+1) / 15 = 1.533$ goals.

This represents the mean number of goals scored per game by the team.

The following tutorials provide more information on probability distributions: