Class Worksheet

September 8 Math 125 Kovitz 2025

The Average: a measurement of the center.

The average of a list of numbers equals their sum, divided by how many there are.

A histogram balances when supported at the average.

The Median: a measurement of the center.

The median of a histogram is the value with half the area to the left and half the area to the right.

Median versus average.

Equal if histogram is symmetric, average larger if the histogram has a long right-hand tail, average smaller if the histogram has a long left-hand tail.

The standard deviation: a measurement of spread.

The SD says how far away numbers on a list are from their average. Most entries on the list will be somewhere around one SD away from the average. Very few will be more than two or three SDs away.

Roughly 68% of the entries on a list (two in three) are within one SD of the average, the other 32% are further away. Roughly 95% (19 in 20) are within two SDs of the average, the other 5% are further away. This is so for many lists, but not all.

Calculation of the standard deviation.

Find the average.

Find the deviations from average by subtracting the average from each entry.

Find the root-mean-square of the deviations from average (by taking their squares, the average of these squares, and the square root of that average—be sure to do these steps in this exact order).

The Root-mean-square. Square all entries, take the mean (average) of the squares, and take the square root of the mean.

The term mean-square refers to a square of which we have taken the mean. The term root-mean-square refers to a mean-square of which we have taken the root. That means that the operations are done in reverse order of their positions in the word.

Problems

Find the average and the SD of the list

$$\{6, 12, 15, 18, 24\}.$$

Each person in a group of ten is asked how many times he has been in love. The replies were:

$$\{3, 9, 6, 2, 1, 5, 0, 8, 2, 4\}.$$

Find the average and the median number of times a person in that group has been in love.

Find the standard deviation for the number of times that a person in that group has been love.

What portion of the replies are one SD or less away from the average?

What portion of the replies are two SDs or less away from the average?

Note If a study draws conclusions about the effects of age, find out whether the data are cross-sectional or longitudinal.

Formulas

r.m.s. size of a list =
$$\sqrt{\text{average of (entries)}^2}$$
.

SD = r.m.s. deviation from average

which may be restated as

 $SD = \sqrt{average of (deviations from average)^2}.$

(Alternate Formula for SD)

$$SD = \sqrt{average of (entries)^2 - (average of entries)^2}.$$