

A Psychologist's Guide to Statistics

Think about how stupid the average person is; now realize half of them are dumber than that.
- George Carlin

Statistics are like bikinis. What they reveal is suggestive, but what they conceal is vital.
~Aaron Levenstein

He uses statistics as a drunken man uses lamp posts - for support rather than for illumination.
~Andrew Lang

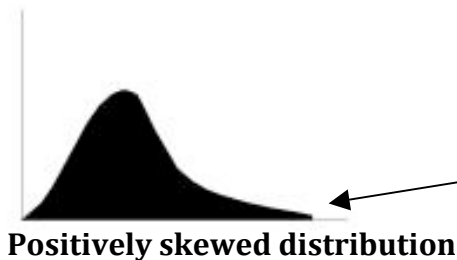
Measures of Central Tendency

Mean: total of all observations (scores) divided by the number of observations (scores)

Median: the middle value when observations (scores) are ordered

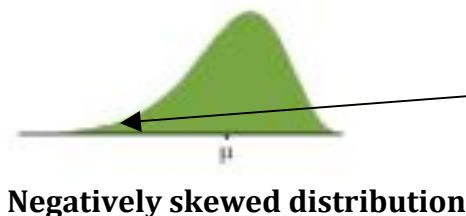
Mode: the value of the most frequent observation (score)

When a distribution of observations (scores) is not too skewed, the values of the mode, the median and the mean are similar. In the case of extreme observations (outliers), however, the mean is more sensitive than the median or mode. Skewed distributions are described by their tails:



One or a few extremely positive outliers skew this distribution. If the tail points in a positive direction (the right), the distribution is positively skewed.

Ex. Let's assume all your parents are in a room and we make a graph of all of our household incomes. What happens to the graph if Mark Zuckerberg walks into the room?



One or a few extremely negative outliers skew this distribution. If the tail points in a negative direction (the left), the distribution is negatively skewed.

Ex. Let's assume that all the members of the Boston Celtics and Charlotte Bobcats are in a room and we make a graph of their height/ What happens to the graph if I walk into the room?

Measures of Variation

RANGE

One very easy measure of the variability that exists within a distribution is the range, which is simply the distance between the lowest score in the distribution and the highest.

If the highest score earned on the test in the class is a 97, and the lowest scores was a 77, then the range of scores is 20.

Both variance and standard deviation measures variability within a distribution.

STANDARD DEVIATION

A rough measure of the average amount by which observations deviate on either side of the mean. Simply put, it measures how spread out the values in a data set are.

How to calculate a standard deviation: extract the square root of the variance

So, if the variance is 16, the standard deviation is 4.

A large standard deviation indicates that the data points are far from the mean and a small standard deviation indicates that they are clustered closely around the mean.

VARIANCE

The mean of all squared deviations from the mean.

How to calculate a variance: square the standard deviation

So, if the standard deviation is 5, the variance is 25.

Example from the 2004 AP Psychology Exam:

Which of the following sets of scores has the greatest standard deviation?

- A. 5, 7, 9, 12
- B. 2, 7, 9, 22
- C. 25, 27, 29, 32
- D. 50, 51, 52, 53
- E. 100, 101, 101, 102, 103

Example from the 2004 AP Psychology Exam:

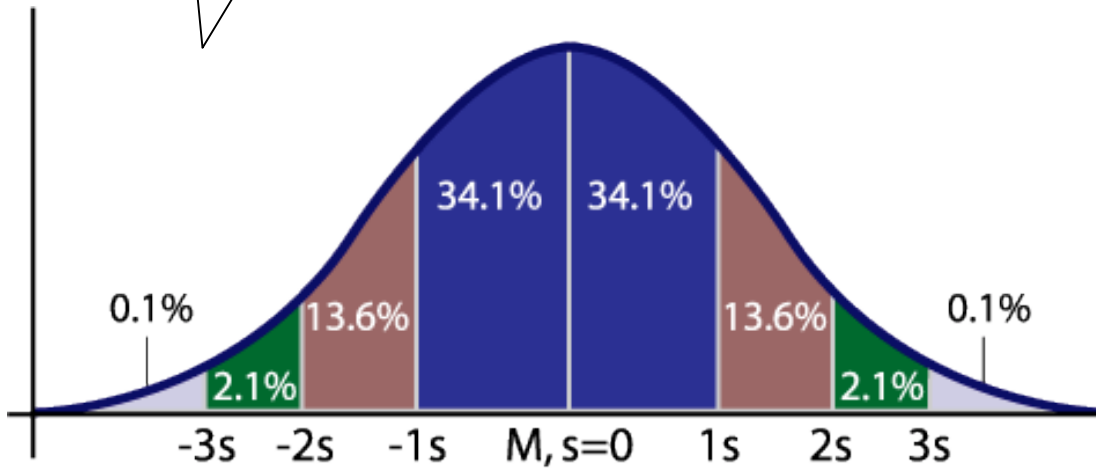
If the variance of a set of scores is 100, the standard deviation will be:

- A. 5
- B. 10
- C. 25
- D. 50
- E. 125

THE NORMAL CURVE: The frequency distribution of many natural phenomena such as the height or intelligence of people of a certain age. Also known as a "bell curve" because of its shape. Standard deviations on a normal curve are as follows:

Make sure you memorize these numbers!

68% are within 1 standard deviation
95% are within 2 standard deviations
99.7 are within 3 standard deviations



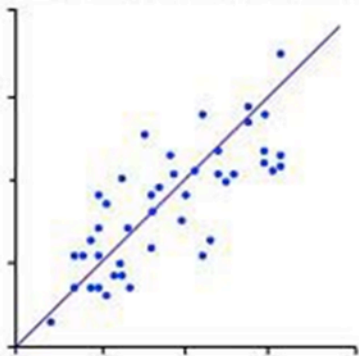
Example from the 2004 AP Psychology Exam:

For a language test with normally distributed scores, the mean was 70 and the standard deviation was 10. Approximately what percentage of test takers scored 60 and above?

- A. 16
- B. 34
- C. 68
- D. 84
- E. 95

Correlation: Remember the Scatter Plots!

Positive Correlation (bottom left to upper right)



Negative Correlation (upper left to bottom right)

