Variance

Variance is the average squared deviation from the mean of a set of data. It is used to find the **standard deviation**.

Variance Formula

The variance formula includes the Sigma Notation, $\sum$, which represents the sum of all the items to the right of Sigma.

$$\frac{\sum (x-\mu)^2}{n}$$

Mean is represented by μ and n is the number of items.

Variance

1. Find the mean of the data.

   Hint – mean is the average so add up the values and divide by the number of items.

2. Subtract the mean from each value – the result is called the **deviation from the mean**.

3. Square each deviation of the mean.

4. Find the sum of the squares.

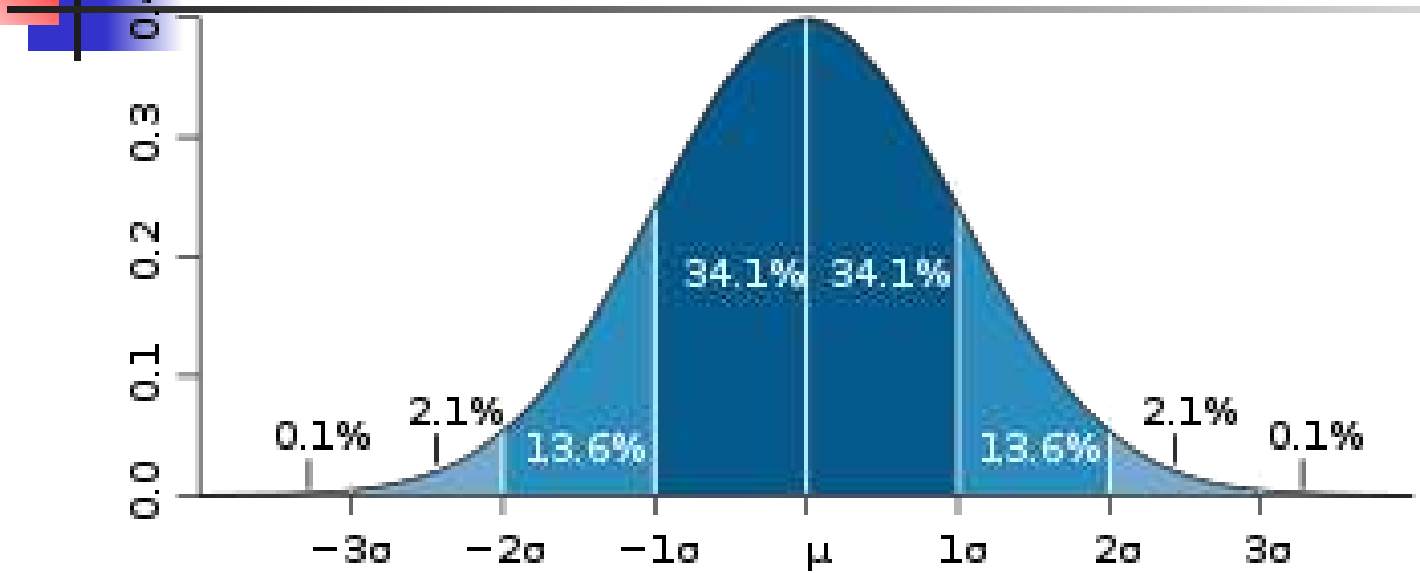
5. Divide the total by the number of items.

Standard Deviation

Standard Deviation shows the variation in data. If the data is close together, the standard deviation will be small. If the data is spread out, the standard deviation will be large.

Standard Deviation is often denoted by the lowercase Greek letter sigma, σ.

The **bell curve** which represents a normal distribution of data shows what standard deviation represents.



One standard deviation away from the mean (μ) in either direction on the horizontal axis accounts for around 68 percent of the data. Two standard deviations away from the mean accounts for roughly 95 percent of the data with three standard deviations representing about 99 percent of the data.

Standard Deviation

Find the **variance**.

a) Find the **mean** of the data.

b) Subtract the mean from each value.

c) Square each deviation of the mean.

d) Find the sum of the squares.

e) Divide the total by the number of items.

Take the square root of the variance.

Standard Deviation Formula

The standard deviation formula can be represented using Sigma Notation:

$$\sigma = \sqrt{\frac{\sum (x - \mu)^2}{n}}$$

Notice the standard deviation formula is the square root of the variance.

Find the variance and standard deviation

The math test scores of five students are: 92,88,80,68 and 52.

1) Find the **mean**: (92+88+80+68+52)/5 = 76.

2) Find the **deviation from the mean**:

92-76=16

88-76=12

80-76=4

68-76= -8

52-76= -24

Find the variance and standard deviation

The math test scores of five students are: 92,88,80,68 and 52.

3) Square the deviation from the mean:

$$(16)^2 = 256$$
$$(12)^2 = 144$$
$$(4)^2 = 16$$
$$(-8)^2 = 64$$
$$(-24)^2 = 576$$

Find the variance and standard deviation

The math test scores of five students are: 92,88,80,68 and 52.

4) Find the sum of the squares of the deviation from the mean:
   256+144+16+64+576= 1056
5) Divide by the number of data items to find the **variance**:
   1056/5 = 211.2

Find the variance and standard deviation

The math test scores of five students are: 92,88,80,68 and 52.

6) Find the square root of the variance: $\sqrt{211.2} = 14.53$

Thus the standard deviation of the test scores is 14.53.

Standard Deviation

A different math class took the same test with these five test scores: 92,92,92,52,52.

Find the **standard deviation** for this class.

Hint:

1. Find the **mean** of the data.
2. Subtract the mean from each value – called the **deviation from the mean**.
3. Square each deviation of the mean.
4. Find the sum of the squares.
5. Divide the total by the number of items – result is the **variance**.
6. Take the square root of the variance – result is the **standard deviation**.