

Name: _____

How to Find the Mean

The mean is just the _____ of the numbers.

It is easy to calculate: Just add up all the numbers, then divide by how many numbers there are. (In other words it is the sum divided by the count)

Example 1: What is the Mean of these numbers?

55, 34, 4, 65, 9

Step 1 - Add them all together: $55 + 34 + 4 + 65 + 9 = 167$

Step 2 - Divide the total by the number of values you added: 55, 34, 4, 65, 9 are 5 numbers. $167/5 = 33.4$

Now find the average of these numbers on your own:

3, 7, 5, 13, 20, 23, 39, 23, 40, 23, 14, 12, 56, 23, 29

The sum of these numbers is equal to _____ and there are _____ numbers.

The mean of the above numbers is _____.

How to find the Median Value

It's the _____ number in a sorted list.

To find the Median, place the numbers you are given in _____ and find the _____.

Example: Find the median of these numbers:

3, 4, 6, 1, 12, 7, 9

Step 1 - Put them in order: 1, 3, 4, 6, 7, 9, 12

Step 2 - Find the middle number by crossing out one on each side: ~~1~~, ~~3~~, 4, 6, 7, 9, ~~12~~

Step 3 - The center number is the median: 6

Now find the median of these numbers on your own:

3, 13, 7, 5, 21, 23, 39, 23, 40, 23, 14, 12, 56, 23, 29

If we put those numbers in order we have:

There are _____ numbers. Our middle number will be _____.

BUT, if there are an **even** amount of numbers things are slightly different.

In that case we need to find the middle pair of numbers, and then find the value that would be half way between them. This is easily done by adding them together and dividing by _____.

Example: Put the following numbers in order.

3, 13, 7, 5, 21, 23, 23, 40, 23, 14, 12, 56, 23, 29

There are now fourteen numbers and so we don't have just one middle number, we have a pair of middle numbers:

_____ and _____

To find the value half-way between them, add them together and divide by 2:

And, so, the Median in this example is _____.

How to Find the Mode or Modal Value

The mode is simply the number which appears _____.

To find the mode or modal value requires you to put the numbers you are given into a table.

Example: *Find the mode of these numbers:*

2, 5, 4, 5, 8, 4, 5

Step 1: Put the numbers in a table of numbers and counts:

number	count
2	
5	
4	
8	

The one with the most occurrences is the mode.

Find the mode of these numbers: 3, 7, 5, 13, 20, 23, 39, 23, 40, 23, 14, 12, 56, 23, 29

number	count
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Accuracy & Precision

Accuracy is how close a measured value is to the _____ value.

Precision is how close the measured values are to _____.

Examples of Precision and Accuracy:



Low Accuracy
High Precision



High Accuracy
Low Precision



High Accuracy
High Precision

So, if you are playing soccer and you always hit the left goal post instead of scoring, then you are not _____, but you are _____!

Standard Deviation & Variance

The Standard Deviation (σ) is a measure of how spread out numbers are.

The formula is easy: it is the square root of the Variance. So now you ask, "What is the Variance?"

The Variance (which is the square of the standard deviation, ie: σ^2 , is defined as:

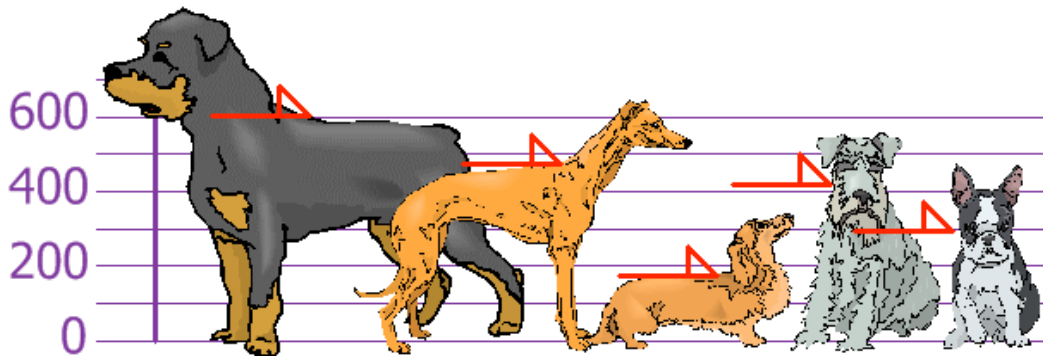
The average of the squared differences from the Mean.

In other words, follow these steps:

1. Calculate the Mean
2. Now, for each number subtract the Mean and then square the result (the squared difference).
3. Find the average of those squared differences. (Why Square?)

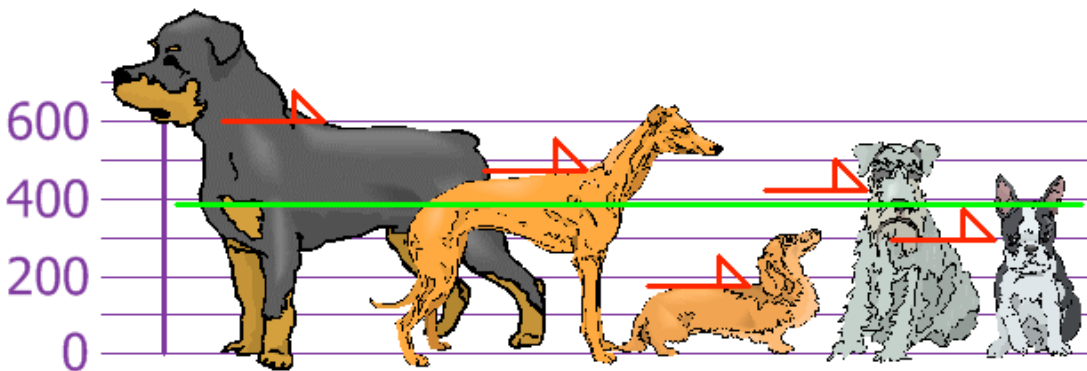
Example

You and your friends have just measured the heights of your dogs (in millimeters):

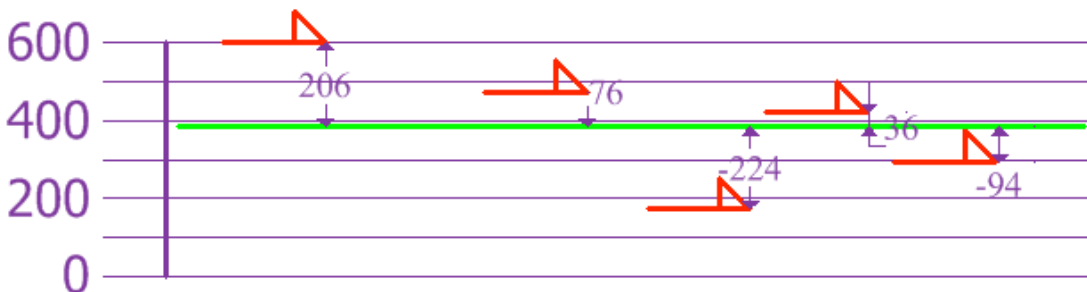


The heights (at the shoulders) are: 600mm, 470mm, 170mm, 430mm and 300mm.

Mean = 394mm



Now, we calculate each dog's difference from the Mean:



To calculate the Variance, take each difference, square it, and then average the result:

$$\text{Variance: } \sigma^2 = 206^2 + 76^2 + -224^2 + 36^2 + 94^2 = 42436 + 5776 + 50176 + 1296 + 8836 = 108520$$

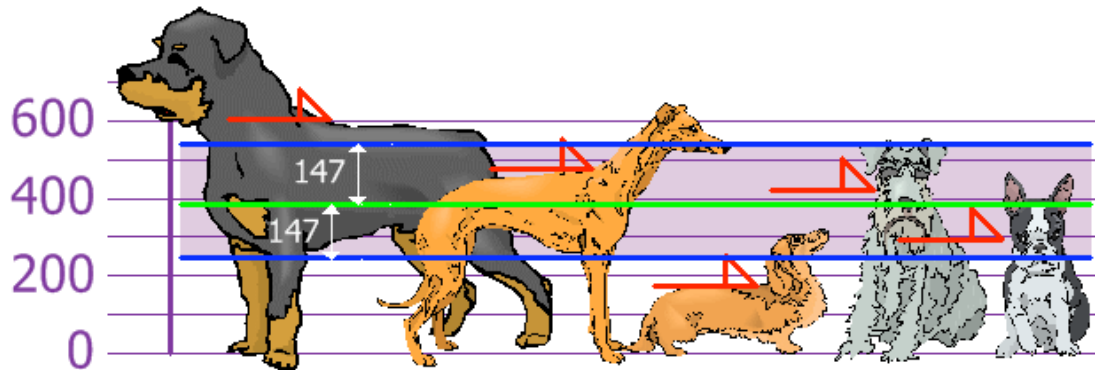
$$108520/5 = 21704$$

So, the Variance is 21704.

And the Standard Deviation is just the square root of Variance, so:

$$\text{Standard Deviation: } \sigma = \sqrt{21704} = 147.32$$

And the good thing about the Standard Deviation is that it is useful. Now we can show which heights are within one Standard Deviation of the Mean:



So, using the Standard Deviation we have a "standard" way of knowing what is normal, and what is extra large or extra small.

Circle which dogs are **extra** tall and **extra** short.

*Note: Why square?

Squaring each difference makes them all positive numbers (to avoid negatives reducing the Variance). But squaring them makes the final answer really big, and so un-squaring the Variance (by taking the square root) makes the Standard Deviation a much more useful number.

Find the mean, median, variance and standard deviation of this set of data:

37, 56, 78, 54, 108, 22, 60, 10

Mean: _____ Median: _____

Variance, σ^2 _____ SD, σ : _____