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Lesson #9.2: Measure of Spread: Standard Deviation

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Learning Goal: We are learning to calculate and ==understand== standard deviation.

When you calculate the mean, or average, you are calculating a single number. On a recent test, your class had an average of 82, but you got a 79. Is it fair to say that you are below average? Not necessarily, as we need to know either the entire data set (all the scores in the class) or the standard deviation.

What is the standard deviation? It is the square root of the average of the squared differences to the mean. Confused? Let's look at the website https://www.mathsisfun.com/data/standard-deviation.html to help us out.

Wow! Standard Deviation is really useful! It allows us to create an __average range__ instead of just a single number. This can also be called the __normal range__. Let's do an example, then see how we can use it.

Calculate the standard deviation by following these 5 steps.

1. Calculate the mean
2. Subtract the mean from every data point.
3. Square each of those differences.
4. Average the differences. This is the variance.
5. Square root the variance.

Test scores in a Math class were as follows: 79, 67, 85, 81, 88, 74, 93, 82, 80, 91.

Mean: add up the scores: $\dfrac{820}{10} = 82$

Data	Subtract mean:	Square	Average the squares	Square root
79	$79 - 82 = -3$	9	Add the Squares:	
67	$67 - 82 = -15$	225		$\sqrt{52.2}$
85	$85 - 82 = 3$	9		
81	$81 - 82 = -1$	1		
88	$88 - 82 = 6$	36	$\dfrac{550}{10}$	$= 7.4$
74	$74 - 82 = -8$	64		
93	$93 - 82 = 11$	121	$= 55$	
82	$82 - 82 = 0$	0		
80	$80 - 82 = -2$	4		
91	$91 - 82 = 9$	81		

Now that we have the standard deviation, calculate the ==normal range==:

7.4

Low end = mean – stdev: $82 - 7.4 = 74.6$

High end = mean + stdev: $82 + 7.4 = 89.4$

> within this range is a normal test result.

Given this range, can you now consider your score of 79 to be within the average, or the normal result?
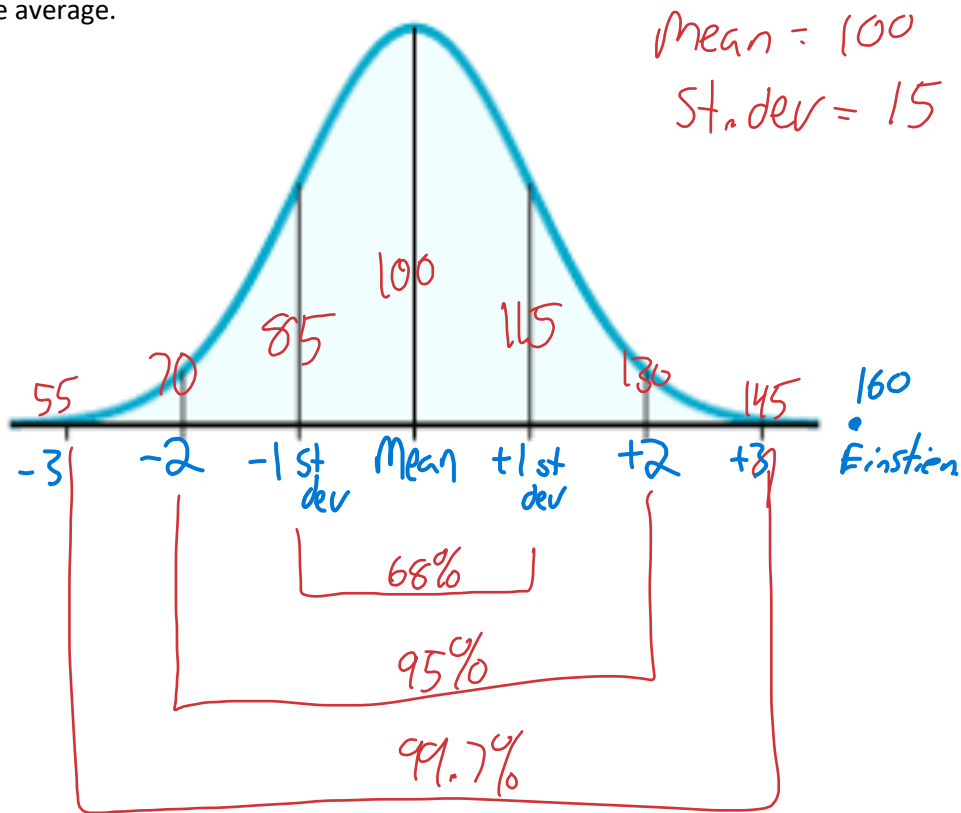
Yes!

Which scores exceeded the normal range? **67, 74, 91, 93**

Normal Distribution:

The heights of male/females, the birth weight of a baby, ==IQ test scores==, university/college entrance exams, blood pressure, and error allowance by manufacturing machines are all examples of statistics that follow a normal distribution.

A normal distribution is also called a bell curve (given its shape). It shows us approximately what percentage of the population is near the average.

Mean = 100
St. dev = 15

100
85   115
55   70   130   145   160
-3   -2   -1 st   Mean   +1 st   +2   +3   Einstien
            dev   dev

68%
95%
99.7%

Success Criteria:
- I can calculate the standard deviation and use it to determine the normal range
- I can understand what a normal distribution is