Engineering Virtual Learning

HS Intro to Engineering Design Lesson #13

April 22, 2020

Objective/Learning Target:

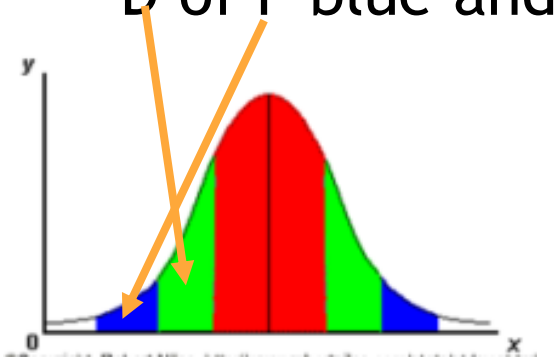
Students will use collected “Free Throw” data to work with standard deviation.

(project day 3 of 4)

Bell-work:

Do you think teachers should grade on a Bell Curve?

What if that meant that 1/3 of the class was in the D of F blue and green area?



Record your answers in your engineers notebook in the "Free Throw Activity and the Empirical Rule"

Learning Practices: Standard Deviation

The standard deviation is a measure of the spread of data values or the measure of data variation. (The learning resources page 7 has links to videos about Standard Deviation)

- A larger standard deviation indicates a wider spread in data values
- A smaller standard deviation indicates a smaller spread in data values or more consistency.

$$\sigma = \sqrt{\frac{\sum(x_i - \mu)^2}{N}}$$

σ = standard deviation

x_i = individual data value (x_1, x_2, x_3, …)

μ = mean

N = size of population

(Copy this formula for standard Deviation in your engineers notebook.)

Learning Practice:

Find the Standard Deviation of your **made** free throws from Monday.
Use this example of the sample data to show you the steps.

Number of Free Throws Made
15 made
12 made
16 made
9 made
14 made
15 made
6 made
13 made
11 made
18 made

x	x - μ	$(x - \mu)^2$
15	15 - 12.9 = 2.1	(2.1)(2.1) = 4.41
12	12 – 12.9 = -.9	(-.9)(-.9) = .81
16	16 - 12.9 = 3.1	(3.1)(3.1) = 9.61
9	9 – 12.9 = -3.9	(-3.6)(-3.9) = 15.21
14	1.1	1.21
15	2.1	4.41
6	-6.9	47.61
13	0.1	0.01
11	-1.9	3.61
18	5.1	26.01
		Sum = 112.9

Step 1: fill in the "x" column with your data points.
Step 2: since (x - μ) is your data minus the mean (12.9 for sample), take each of your data and subtract the mean you calculated for your data. Yes you might get some negative numbers. Remember we are looking at data above and below the mean or average.
Step 3: square the value you get in step 2 (gives a positive number)
Step 4: add (sum) all of column 3.
Step 5: finish the standard deviation formula $\sigma = \sqrt{\frac{\Sigma(x_i - \mu)^2}{N}}$,
where n = 10 shots or values.

Step 5: 112.9 / 10 = 11.29 $\sigma = \sqrt{11.29}$ = 3.36 is the standard deviation

Check for Understanding:

- For the sample data the Standard Deviation was 3.36. This means on average the collected data was about 3.36 away from the average.

- Was your standard Deviation higher or lower than this?

- Do you think you had more or less consistency than the sample data?

Learning Resource Links:

Standard Deviation –

https://www.youtube.com/watch?v=E4HAYd0QnRc

https://www.youtube.com/watch?v=HvDqbzu0i0E