PRE-CALC & TRIG

Day 67

Bell Work

- Why does an outlier impact the mean more than any other of the measures of central tendency (median/mode)?
- What can we do in real life situations to avoid this impact?

From Last Time

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11.7 Standard Deviation

Objective: To find and apply the standard deviation and variance of a set of values

Measure of variation: describes how data is spread out (example: range)

Standard Deviation: $\boldsymbol{\sigma}$ $(\boldsymbol{sigma})$ measure of how much the values in a data set vary ,or deviate, from the mean (x bar)

Variance: $\boldsymbol{\sigma^2}$ $(\boldsymbol{sigma\ squared})$ the square of the standard deviation

*in other words, standard deviation is the square root of the variance

Formulas

Variance: $\boldsymbol{\sigma^2 = \frac{\sum(x-\bar{x})^2}{n}}$

Standard Deviation: $\boldsymbol{\sigma = \sqrt{\frac{\sum(x-\bar{x})^2}{n}}}$

Steps to finding Variance/Standard Deviation

1. Find the mean of the values in the data set → $\bar{x}$
2. Find the difference $(x - \bar{x})$, between each value x and the mean
3. Square each difference $(x - \bar{x})^2$
4. Find the average of these squares ←variance
5. Take the square root of the variance (step 4) ← standard dev

Example:

What is the mean, variance and standard deviation of the following values?

8, 12, 10, 13, 9, 20

Solution

Mean: 72/6=12

Variance:

$$\frac{(8-12)^2+(12-12)^2+(10-12)^2+(13-12)^2+(9-12)^2+(20-12)^2}{6}$$

$$\textit{Variance} = \frac{16+0+4+1+9+64}{6} = \frac{94}{6} = 15.666666666666\ldots$$

$$\text{Standard deviation} = \sqrt{15.66666\ldots} = 3.958114\ldots$$

Compare the data:

-3SD	-2SD	-1SD
0.486	4.084	8.042

Mean

12

+1SD	+2SD	+3SD
15.958	19.916	23.514

What does this all mean?!

We can see that the 20 is the one that is different than the rest because all other numbers are right around 1 standard deviation of the mean and the 20 is beyond the 2^{nd} standard deviation. It is important to note that all data falls within 3 standard deviations of the mean however. We'll explore that in 11.10 and how this all can be applied to real life situations.

For Next Time

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