



Unit 8 Lesson 4A: 0.9 Measures of Central Tendency



Learning Target: I can determine the mean, median, mode, range, standard deviation, and variance of a set of data.

- **Statistics** is the science of collecting, organizing and analyzing data in order to draw conclusions and make predictions.
- The entire group of interest to a statistician is called a **population**. *who/what you want to describe*
- A **sample** is used when it is not possible to obtain data about every member of a population (a subset of the population *who/what you get #'s (info) from.*)



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Use the scenario to identifying populations and samplings.

1) A beverage company wanted to see if people in the United States liked their new logo. Which choice best represents a population?

- A. A selection of logo artists.
- B. Every person in the United States.
- C. A selection of shoppers from different states.
- D. 3,800 children age 5 - 15

2) A musician wanted to see what people who bought his last album thought about the songs. Which choice best represents a sample?

- A. Every person who bought the album.
- B. A selection of people who didn't want to buy the album.
- C. 250 girls who bought the album.
- D. A selection of 3,294 people who bought the album.



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3) A gaming website wanted to find out which console its visitors owned. Which choice best represents a population?

A. Visitors to the 3DS section.

B. All of the website visitors.

C. Visitors to the PS4 section.

D. Visitors who are on the website for more than 5 minutes.

4) Before a nation wide election, a polling place was trying to see who would win. Which choice best represents a sample?

A. A selection of voters over age 50.

B. A selection of male voters.

C. A selection of voters of different ages.

D. All voters.



Unit 8 Lesson 3A: 0.9 Measures of Central Tendency

Learning Targets:

I can determine if data represents a sample or population.

I can determine the mean, median, mode, range, standard deviation, and variance of a set of data.

Notations for Mean

$$\begin{array}{l} \mu = \text{population mean} \\ (\mu) \quad \frac{x_1 + x_2 + x_3 + \dots + x_n}{n} \\ \bar{X} = \text{sample mean} \\ \bar{x} \text{-bar} \quad \frac{x_1 + x_2 + x_3 + \dots + x_n}{n-1} \end{array}$$

The most common measures of average (measures of center) are:

- **Mean:**

The average we are most familiar with.

<u>Total all #s</u> How many #s in the set

- **Median:** Middle # when arranged in order from least to the greatest. Average the 2 middle if an even # in set.

- **Mode:** The you see the MOST in the set.



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Learning Target: I can determine the mean, median, mode, range, standard deviation, and variance of a set of data.

Example 5:

Using the list of numbers below, find the mean, median, and mode.

50, ~~30~~, ~~25~~, ~~20~~, ~~40~~, 35, ~~35~~, ~~10~~, ~~15~~, ~~35~~

Population

$$\text{Mean: } M = \frac{295}{10} = 29.5$$

Median: 10, 15, 20, 25, ^{32.5}30, 35, 35, 35, 40, 50

$$\frac{30+35}{2} = \frac{65}{2} = 32.5$$

Mode: 35



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Because two very different data sets can have the same mean, statisticians also use measures of spread or variation

The most common measures of spread are:

* **Range:** Greatest - smallest

○ **Variance:** $\sigma^2 = \frac{(x_1 - \mu)^2 + (x_2 - \mu)^2 + (x_3 - \mu)^2 + \dots + (x_n - \mu)^2}{n}$ pop

○ **Standard Deviation:** $s_x^2 = \frac{\quad}{n-1}$
 $s_x = \sqrt{\text{variance}}$

sample

$\sigma = \text{pop. St. dev.}$
 $s_x = \text{sample St. dev.}$



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Example 6:

Find the standard deviation for each set of data:

POP -10, 0, 10, 20, 30

vs.

8, 9, 10, 11, 12 POP

$$n = 5 \quad \bar{M} = \frac{50}{5} = 10$$

$$n = 5$$

data X_n	$X_n - \bar{M}$	$(X_n - \bar{M})^2$
-10	-10 - 10 = -20	400
0	0 - 10 = -10	100
10	10 - 10 = 0	0
20	20 - 10 = 10	100
30	30 - 10 = 20	400

$$s_x = 1.58 \quad (\text{sample st dev.})$$

$$\sigma^2 = \frac{1000}{5} = 200 \quad (\text{variance})$$

$$\sigma = \sqrt{200} = 10\sqrt{2} \approx 14.14$$



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Learning Target: I can determine the mean, median, mode, range, standard deviation, and variance of a set of data.

Example 7: Two classes took the same final exam. The scores of five students from each class are shown. Both sets of scores have a mean of $\underline{84.2}$.

Class A: Sample
85, 76, 92, 88, 80 s_x

Class B:
75, 85, 95, 98, 68

a) Find the range, variance, and standard deviation of Class A.

Range: $92 - 76 = \boxed{16}$

st. dev
Sample $s_x = \boxed{6.34}$

variance $s_x^2 = \boxed{40.2}$



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Learning Target: I can determine the mean, median, mode, range, standard deviation, and variance of a set of data.

Example 7 (cont): Two classes took the same final exam. The scores of five students from each class are shown. Both sets of scores have a mean of 84.2.

Class A:
85, 76, 92, 88, 80

Class B: Sample
75, 85, 95, 98, 68

b) Use the calculator to find the range, variance, and standard deviation of Class B.

$$\text{Range} = 98 - 68 = 30$$

$$s_x = 12.79$$

$$s_x^2 = 163.7$$

c). Compare the sample standard deviations of Class A and Class B.

Class A had lower st. dev so scores are closer together in A than in B,