

WARM UP

1. Simplify the identity $\cos\theta \cot\theta + \sin\theta$

2. Simplify the identity $\frac{\tan\theta \csc\theta}{\sec\theta}$

3. Identify the phase shift and period for the function $y = 5\sin 4(x - \pi) - 3$

1

2

3

4

5

6

7

8

9

10

Objectives

- Select appropriate sampling methods based on survey needs and constraints
- Identify Bias in survey questions
- Calculate Standard Deviation and Variance for a dataset
- Interpret the Standard Deviation of a dataset

Homework

- Section 11-7 all problems
- Section 11-6 all problems

Have you heard of the U.S. Census?



Any guesses as to the cost of the 2010 Census?

\$13.1 Billion. Ye\$, billion with a B.

Most of the time it's not practical to survey an entire population. That's why we create **samples** of a **population**.



A **population** is all the members of a set.

A **sample** is a part of the population.



There are several ways to choose members of a sample...

Convenience Choosing people who are easily available

Self Selection Having people volunteer

Systematic Ordering the population and selecting participants at regular intervals

Random All members of a population have an equal chance of being selected.

When we ask questions in a survey, we may accidentally on purpose introduce bias.

How would you rate the performance of legendary baseball player Jackie Robinson?

Do you agree that ugly yellow cupcakes taste worse than bright pink cupcakes?

Bias can be introduced into survey questions. Questions should not be...

Confusing

Ask about more than one issue or use double negatives

Ambiguous

Offer answer choices that overlap

Loaded

Use words that promote strong reactions

Leading

Suggest one particular answer is correct

Look at 11-7 Re-Teaching

1. The politician spends 9:00 A.M. to 4:00 P.M. on Tuesday talking to people as they enter a grocery store. **convenience; excludes people who don't shop during that day**
2. The politician sets up a questionnaire on his website. **self-selected; excludes people without Internet access**
3. How do you feel about the toxic pollution being released into the air by the local manufacturing plants? **Loaded question; using the words *toxic pollution* rather than *emissions* can cause strong reactions.**
4. Isn't a school bond not the right way to raise money for local education? **Confusing question and leading question; it has a double negative and suggests an answer.**
5. Which city service is most important to you?
 (A) road maintenance (B) fire (C) public works (D) police
Ambiguous question; choices of road maintenance and public works overlap.
6. Do you think your local library should offer videos and Internet access?
Confusing question; it asks about more than one issue.

Measures of Central Tendency

{1, 2, 3, 4, 4, 4, 5, 5, 6, 7, 8, 9, 10}

Mean

The average of all the members of the set. Add up all the values and divide by the sum by number of values. **5.23**

Median

The member of the set that falls exactly in the middle. If you have an odd number of elements, take the average of the two numbers in the middle. **5**

Mode

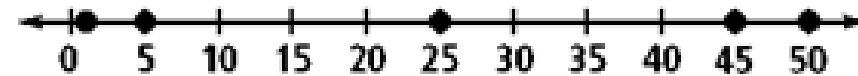
The value in the set that occurs the most. **4**

Problem: Two data sets can have the same mean but look very different.

Set A: {23 24 25 26 27}



Set B: {1 5 25 45 49}



Both of these datasets have the same mean of 25.

Notice that Set A has most of its data closely grouped together.

Set B has data that is more spread out.

Standard Deviation tells us more about how the data is spread around the mean.

Step 1: Calculate Mean

$$\bar{x} = \frac{23 + 24 + 25 + 26 + 27}{5} = 25$$

Step 2: Subtract the mean from each value in the dataset

$x - \bar{x}$	$(x - \bar{x})^2$
$23 - 25 = -2$	$(-2)^2 = 4$
$24 - 25 = -1$	$(-1)^2 = 1$
$25 - 25 = 0$	$(0)^2 = 0$
$26 - 25 = 1$	$(1)^2 = 1$
$27 - 25 = 2$	$(2)^2 = 4$
Total $(x - \bar{x})^2$	10

Step 3: Sum the squared differences and divide by n $\frac{10}{5} = 2$

Step 4: Take the square root of your answer from step 3. This is the **standard deviation.**

$$\sqrt{2} = 1.41421356$$

Calculate the Standard deviation for the other dataset.

Step 1: Calculate Mean

$$\bar{x} = \frac{1 + 5 + 25 + 45 + 49}{5} = 25$$

Step 2: Subtract the mean from each value in the dataset.

Step 3: Square the differences

Step 4: Sum the squared differences and divide by n

$$\frac{1952}{5} = 390.4$$

Step 5: Take the square root of your answer from step 4. This is the **standard deviation**.

$$\sqrt{390.4} = 19.75854246$$

$x - \bar{x}$	$(x - \bar{x})^2$
$1 - 25 = -24$	$(-24)^2 = 576$
$5 - 25 = -20$	$(-20)^2 = 400$
$25 - 25 = 0$	$(0)^2 = 0$
$45 - 25 = 20$	$(20)^2 = 400$
$49 - 25 = 24$	$(24)^2 = 576$
Total $(x - \bar{x})^2$	1952

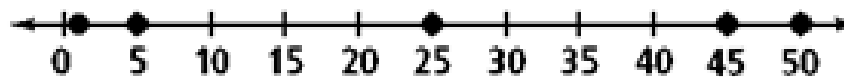
So the formula for Standard Deviation is...

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

Set A: {23 24 25 26 27} $\sigma = 1.41421356$



Set B: {1 5 25 45 49} $\sigma = 19.75854246$



So the larger the standard deviation, the bigger the spread in the data

Now, let's find an easier way to calculate standard deviation.

On your calculator

STAT | EDIT | enter the data in L1

STAT | CALC | 1: 1 – Var Stats

Select L1 for List and press enter

Do you see σx =? That is your standard deviation!

$\sigma x = 1.41421356$

Set A: {23 24 25 26 27}



Now try data set B

On your calculator

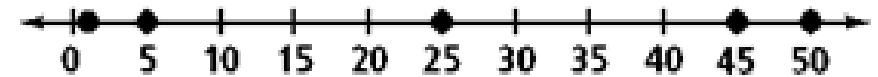
STAT | EDIT | enter the data in L1

STAT | CALC | 1: 1 – Var Stats

Select L1 for List and press enter

.

Set B: {1 5 25 45 49}



$$\sigma x = 19.75854246$$

You can use your calculator for the rest of your homework.