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Prezi: <https://prezi.com/view/H3mt6eubg6EHRwxxPAmc/>

Possible sites that contain pre-made statistics videos (Just ones off the top of my head and or mentioned in the sessions during Q&A, there are probably lots I have not included).

* Pardis Sabeti with Against All Odds: Inside Statistics: <https://www.learner.org/series/against-all-odds-inside-statistics/>
* Crash Course Statistics: <https://thecrashcourse.com/topic/statistics/>
* Dr. Nic’s Maths and Stats: <https://www.youtube.com/channel/UCG32MfGLit1pcqCRXyy9cAg>
* Professor Leonard: <https://www.youtube.com/playlist?list=PL5901C68C96DFCAD1>

Possible resource sites mentioned in the session.

* Stats Medic: <https://www.statsmedic.com/>
* Skew The Script: <https://skewthescript.org/>
* Against All Odds also has labs and materials that goes along with their videos: <https://www.learner.org/series/against-all-odds-inside-statistics/>

Below you will find the entire lessons we have used to teach measure of center and spread over two classroom days.

**Measures of Central Tendency: Mode, Median, and Mean**

Low Floor è High Ceiling

Part 1

Compute the mean, median and mode height of everyone in your group.

1. Write the height of each member in your team on the board.
2. Calculate the mean height of everyone in your group. Show your work and write your solution on the board.
3. Move to the next board and verify their calculation is correct.
4. Move to the next board and determine the median and mode value of the heights on the board.
5. Move to the next board and verify the correct median and mode was identified.

Part 2

Comparison

Use the following data to calculate the measures of central tendency to describe the center of the data set. Here are the final grades for a class of 34 students in a prior MAT 171 (Precalculus Algebra) course.

A, B, A, B, A, A, C, C, A, B, C, B, B, B, B, C, C, C, A, C, C, C, C, D, B, A, C, B, C, F, B, C, B, B.

* 1. Compute the mode of the final grades and write your solution on the board. \*Show your work\*
  2. Compute the median of the final grades and write your solution on the board. \*Show your work\*
  3. Compute the mean of the final grades and write your solution on the board. \*Show your work\*

Teacher assignment: Students can’t calculate the mean of categorical data. Watch what they do. Have students from each group share their groups approach to each other.

Group discussion: Can we calculate the mean of this data set? Why? Why not?

* 1. Let’s assign a numerical value, GPA value, to each letter in the data set above and then calculate the mean GPA of the final grades and write your solution on the board. \*Show your work\*

Group discussion on weighted mean.

Part 3

Food – [use CPI percentage change published January 25, 2023)

* 1. Using the data provided, select a reasonable yearly household income.
  2. Predict the 2023 Food budget based on that income – for all given categories.
  3. Write / explain the approached used to create your group forecasted results.
  4. Write changes the group would make based on group preference.

Part 4 – Extension (High Ceiling)

Geometric Mean

* 1. For the three years shown, convert the percent change into a decimal (i.e. 1 +/- the percentage change given).
  2. Multiply the three values.  (do this for each of the categories)
  3. Compute the cube root for each of the values.
  4. Describe what the meaning is of that result.

**Measures of Variation**

Part 1

The lowest temperature on record for NC was measured near the top of Mount Mitchell in Yancey County on January 21, 1985. The temperature that day reached a minimum of -34 degrees Fahrenheit. The hottest temperature on record for NC was measured in Fayetteville on August 21, 1983, when the mercury peaked at 110 degrees Fahrenheit. The average low temperature of Asheboro is 49.3 degrees Fahrenheit. The average high temperature in Asheboro is 69.8 degrees Fahrenheit.

* As a group, go to your board and compute the range and standard deviation of the temperatures above. Need help, look at the procedure chart on page 105 in your textbook.
* Then discuss the question: How does Asheboro temperature compare to record temperatures in NC? Write your group’s answer to the question on the board.

Have groups move to a different board and check the work of their peers. NO ERASING. Use a different color marker!

* Have students calculate the variation at each new board and describe the relationship between variation and standard deviation.
* Ask students: Did you enjoy calculating the standard deviation by hand? Why or why not?

Part 2

Open SALT. Find the Ocean Temperatures Data Set. Import that. Click on Coast/Region/Location/Jan/Feb/Mar/Apr/May/Jun/Jul/Aug/Sep/Oct/Nov/Dec.

1. Analyze the ocean temperatures for the month of \_\_\_\_\_\_\_.
2. Compute the mean, median, mode, range, variation, and standard deviation of the ocean temperatures for the month above and record these on the board.
3. Create at least two graphical representations of the ocean temperatures for the month above. Sketch these on the board. (Don’t draw tiny sketches, we will use these later).

Now, as a group, walk around the room and look at each board. Look at the standard deviation computed, and the graphs sketched on the boards. How does the numerical standard deviation compare to the visual representation (the graphs). How does the numerical standard deviation compare to how much or how little the data is spread out?

1. Go back to your original board and write a sentence describing the spread of the ocean temperatures in your month with words everyone can understand, not just those studying statistics.

Now, as a group, walk around the room and look at each board. Look at the measures of center (mean, median and mode). Look at the graphs. Describe where you think the average temperature of that month falls.

1. Go back to your original board and write a sentence describing the center of the ocean temperatures in your month with words everyone can understand, not just those studying statistics.
2. Write a summary of the data for the month above. Use words any one can understand, not just those studying statistics.

Have students move to a new board. Have them look at the previous group’s work and decide if they agree or disagree with the summary that group wrote. If they disagree, make sure they write why on the board.

Part 3

At your current board, compute the coefficient of variation (CV) of the month summarized.

Now, as a group, walk around the room and look at each board. Look at the CV’s calculated for the different months.

* 1. Compare this to the average and standard deviation for that month. Discuss as a group, what would be an advantage of using the CV instead of the standard deviation to describe the spread of the ocean temperatures in a month.

Part 4

At your current board, look at the dotplot and the histogram of the ocean temperatures. Discuss as a group, create “boundaries” by drawing two lines on each graph. These “boundaries” need to represent 75% of the ocean temperatures in our data set for that month.

* 1. Grab the teacher and explain to them where your group decided to draw these boundaries and why.

Now the teacher can ask the group if they know what Chebyshev’s Theorem is. If they get it, great, if not, refresh their minds. Then hand students the next part. Might have to get them going in the right direction with a little guidance.

Part 5

Calculate the interval that contains at least 75% of the ocean temperatures for the month. How might this information be useful in other contexts besides ocean temperatures? Write your thoughts on the board.