From Mean to MAD: Building Conceptual Understanding of Center and Spread

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Data in Real Life

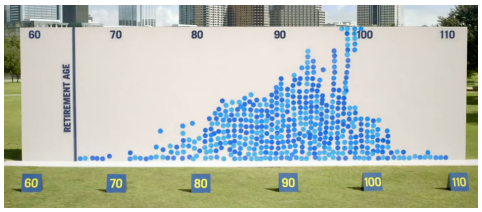
Data in Real Life – OUR TURN!

Place your post-it in the correct location on the dot plot to show the age of the oldest (living) person you know.

Data in Real Life

- What can you learn about this group from the distribution?
- What can you learn about yourself from the distribution?
- Which measure of center, mean or median, best represents the 'typical' data value?
- What would the MAD tell you?

Data in Real Life



How does our dot plot compare?

What is a "measure of center"?

a value at the center or middle of a data set

From Median to Mean

- Median: describes the center of a numerical data set in terms of how many data points are above and below it
- Mean: the measure of center obtained by adding the values and dividing the total by the number of values

Do these definitions contribute to student understanding?

From Median to Mean

- Many students believe that the mean is ALWAYS a better measure of center, no matter what.
- Students do not understand the advantages of each statistic and when to use each.

What are the instructional deficiencies that may lead to these misconceptions?

Summarized from: "Mean and Median: Are the Really So Easy?"
By Judith Zawojewski and J. Michael Shaughnessy

From Median to Mean: **MEDIAN**

- On your personal dot plot, record the answers of those sitting at your table.
- Place an arrow marking the location of the median.

From Median to Mean: **MEDIAN**

Transfer this information onto the laminated dot plot using the following color code:

- Red stickers for values below the median
- Yellow stickers for values above the median
- Green stickers for values that are equal to the median
- Place an arrow at the location of the median.

From Median to Mean: **MEDIAN**

describes the center of a numerical data set in terms of how many data points are above and below it

Why is the MEDIAN a measure of center?

From Median to Mean: **MEDIAN**

In your groups respond to the following:

- How would adding the value of 40 to your distribution change your MEDIAN?
- How would adding the value of 120 to your distribution change your MEDIAN?

What can you say about the effect of data values on the MEDIAN?

From Median to Mean: **MEAN**

Transfer this information onto the laminated dot plot using the following color code:

- Red stickers for values below the mean
- Yellow stickers for values above the mean
- Green stickers for values that are equal to the mean
- Place an arrow at the location of the mean.

From Median to Mean: **MEAN**

the measure of center obtained by adding the values and dividing the total by the number of values

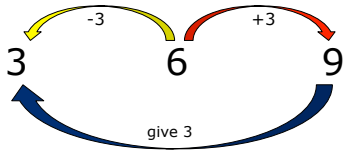
From Median to Mean: **MEAN**

- In what ways is the mean the "center" of a distribution?
- Explore this question with your tablemates using your group dot plot.

Hint: How can you find the mean without the formula?

From Median to Mean: **MEAN**

- Why is the mean a measure of center?
- Two ways of thinking about mean
  - Fair share
  - Balance point



From Median to Mean: **MEAN**

In your groups respond to the following:

- How would adding the value of 40 to your distribution change your MEAN?
- How would adding the value of 120 to your distribution change your MEAN?

What can you say about the effect of values on the MEAN?

From Median and Mean

- In your distribution, which is higher, the MEAN or the MEDIAN?
- Which is a better measure of the "typical" age selection of your tablemates?
- When is mean a "better" measure of center?
- When is median a "better" measure of center?

What is a measure of spread?

A descriptive measure of the degree of variability in a population or sample.

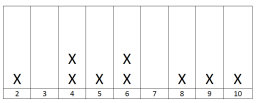
From Mean to MAD

The 4 distributions given represent the number of boxes of candy bars each member of four different groups sold.

Which group did the best?

From Mean to MAD

A



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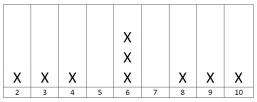

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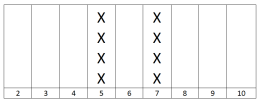

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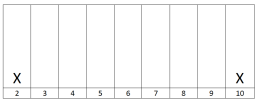

From Mean to MAD

- How did you determine your order?
- Why can't we use a measure of center to make our decision this time?
- Which distribution shows data values that differ the least from the mean?
- Which distribution shows data values that differ the most from the mean?

From Mean to MAD: **MAD**

- Create an individual dot plot of the distances from the MEAN
- How can this distribution be used to find the MAD?

From Mean to MAD: **MAD**

Transfer this information onto the laminated dot plot using the following color code:

- Red stickers for values below the MAD
- Yellow stickers for values above the MAD
- Green stickers for values that are equal to the MAD
- Place an arrow at the location of the MAD.

If the MAD is the **mean** absolute deviation, should it have the same properties as the mean?

From Mean to MAD: **MAD**

MEAN ABSOLUTE DEVIATION

Average distance of data values from the mean.

Can students derive this definition on their own?

From Mean to MAD: **MAD**

MEAN ABSOLUTE DEVIATION

Center based on "distance"

Distance without direction

The "center" of the distances from the mean

From Median to Mean: **MAD**

In your groups respond to the following:

- How would adding the value of 40 to your distribution change your MAD?
- How would adding the value of 120 to your distribution change your MAD?

What can you say about the effect of values on the MAD?

Summary

- How can these activities deepen understanding of center?
- How can these activities deepen understanding of spread?
- How can these activities promote the standards for mathematical practice?

QUESTIONS??

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Clayton State University

PLEASE COMPLETE THE CONFERENCE SURVEY

Resources

- **Articles:**
  - "Mean and Median: Are the Really So Easy?" by Judith Zawojewski and J. Michael Shaughnessy (MTMS)
  - "Statistics in the Middle Grades: Understanding Center and Spread" by Gary Kader (MTMS)
  - "Means and MADs" by Gary Kader (MTMS)
  - "Developing a Meaningful Understanding of the Mean" by Elizabeth George Bremigan (MTMS)
- **Reports:**
  - "Guidelines for Assessment and Instruction in Statistics Education" (GAISE)
  - "Progressions for the Common Core State Standards in Mathematics: 6-8 Statistics and Probability"
- **NCTM Books:**
  - "Developing Essential Understanding of Statistics: Grades 6-8"
  - "Thinking and Reasoning with Data and Chance"
- **Websites:**
  - Plop It: http://www.shodor.org/interactivate/activities/PlopIt/