Dare to dive into

Susan Troutman
Rice University School Mathematics Project
Director of Secondary Programs
troutman@rice.edu

Carolyn White
Rice University School Mathematics Project
Director of Elementary Programs
clwhite@rice.edu

NCTM Standards – Data Analysis

- **Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them**

  Grades 6–8 Expectations for students:
  - formulate questions, design studies, and collect data about a characteristic shared by two populations or different characteristics within one population;
  - select, create, and use appropriate graphical representations of data, including histograms, box plots, and scatterplots.

- **Select and use appropriate statistical methods to analyze data**

  Grades 6–8 Expectations for students:
  - find, use, and interpret measures of center and spread, including mean and interquartile range;
  - discuss and understand the correspondence between data sets and their graphical representations, especially histograms, stem-and-leaf plots, box plots, and scatterplots.

6ᵗʰ Grade TEKS – Data Analysis

6.12 Measurement and data. The student applies mathematical process standards to use numerical or graphical representations to analyze problems. The student is expected to:

(A) represent numeric data graphically, including dot plots, stem-and-leaf plots, histograms, and box plots;

(B) use the graphical representation of numeric data to describe the center, spread, and shape of the data distribution;

(C) summarize numeric data with numerical summaries, including the mean and median (measures of center) and the range and interquartile range (IQR) (measures of spread), and use these summaries to describe the center, spread, and shape of the data distribution; and

(D) summarize categorical data with numerical and graphical summaries, including the mode, the percent of values in each category (relative frequency table), and the percent bar graph, and use these summaries to describe the data distribution.

6.13 Measurement and data. The student applies mathematical process standards to use numerical or graphical representations to solve problems. The student is expected to:

(A) interpret numeric data summarized in dot plots, stem-and-leaf plots, histograms, and box plots; and

(B) distinguish between situations that yield data with and without variability.

7th Grade TEKS – Data Analysis

7.12 Measurement and data. The student applies mathematical process standards to use statistical representations to analyze data. The student is expected to:

(A) compare two groups of numeric data using comparative dot plots or box plots by comparing their shapes, centers, and spreads;

(B) use data from a random sample to make inferences about a population; and

(C) compare two populations based on data in random samples from these populations, including informal comparative inferences about differences between the two populations.

8ᵗʰ Grade TEKS – Data Analysis

8.11 Measurement and data. The student applies mathematical process standards to use statistical procedures to describe data. The student is expected to:
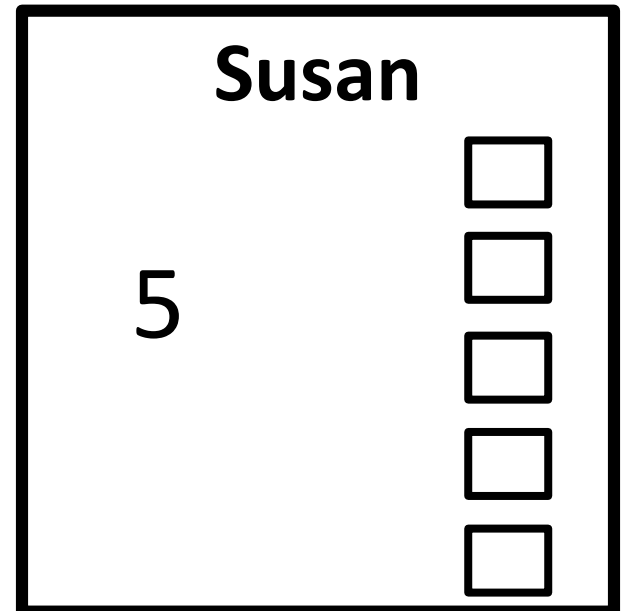
(A) construct a scatterplot and describe the observed data to address questions of association such as linear, non-linear, and no association between bivariate data;

(B) determine the mean absolute deviation and use this quantity as a measure of the average distance data are from the mean using a data set of no more than 10 data points; and

(C) simulate generating random samples of the same size from a population with known characteristics to develop the notion of a random sample being representative of the population from which it was selected.

How many letters are in your first name?

- Write your name at the top of a post-it note.

- Write the number of letters in your first name.

- Draw a box for each letter of your first name.

Example: *Susan*

Susan

5
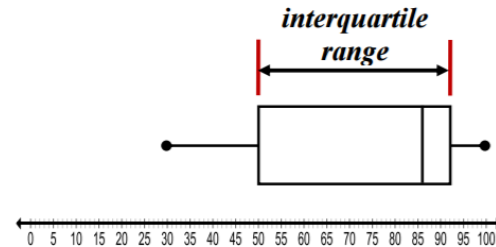
Measures of Center and Measures of Spread

Range (R-e)

Regional Center II, August 2006

median

Regional Center II, August 2006

interquartile range

http://www.ncesd.org

interquartile range

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

mode

Regional Center II, August 2006

$\sqrt{m + e + a + n}$

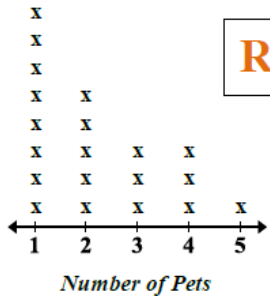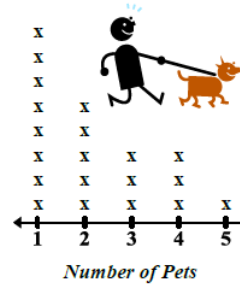Regional Center II, August 2006

Measures of Central Tendency

https://www.youtube.com/watch?v=oNdVynH6hcY

Foldable on Measures of Spread and Center

Range = 4

Number of Pets

A measure of how much a collection of data is spread out. Commonly used types include range and quartiles. (Also known as spread or dispersion.)

Number of Pets

Examples:

Mode = 1

Median = 2

Mean = 2.3

An average; a single value that is used to represent a collection of data. Three commonly used types of averages are mode, median, and mean. (Also called measures of central tendency or measures of average.)

Measures of Spread		Measures of Center		
Interquartile Range (IQR)	Range	Mode	Median	Mean

Think: _____

To find the **mean**:
1. _____ all values.
2. _____ by the number of values.

Think: _____

To find the **median**:
1. Put the data set in _____ from least to greatest.
2. Mark off highest and lowest value, starting from the edges until you reach the _____.
3. If there are two middle values, add them together and _____ by two.

Think: _____

To find the **mode**:
1. Put data set in _____ from least to greatest.
2. Find the number that appears the _____.
3. There may be _____ mode, _____ _____ one mode, or there may be _____ mode.

Think: _____

To find the **range**:
1. Put the data set in _____ from least to greatest.
2. _____ the lowest value from the highest value.

Think: _____

To find the **Interquartile Range (IQR)**:
1. Put data set in _____ from least to greatest.
2. Find the medians of the _____ half (Q1) and the _____ half (Q3) of the data.
3. _____ quartile one (Q1) from quartile three (Q3).

- Cut these apart.

- Glue next to the appropriate term.

|	
6, 8, 11, 13, 20, 23 $23 - 6 = 17$	Describes the middle value of a data set
Describes the spread of the middle half of the data set	8, 11, 12, 18, 18, 20 18
17, 20, 14, 18, 16 $17+20+14+18+16 = 85$ $85 \div 5 = 17$	Describes the general spread of the data
Describes the most frequent value of a data set	2,4,5,7,8,9,10,12,15,16,18 Lower Quartile (Q1) = 5 Median = 9 Upper Quartile (Q3) = 15 $15 - 5 = 10$ Q3 − Q1
7, 11, 13, 14, 16, 17, 50 7, 11, 13, 14, 16, 17, 50 or 3, 4, 8, 9 $(4+8) \div 2 = 6$	Describes the average value of a data set

Measures of Center

Think: __Average__

To find the **mean**:
1. __Add__ all values.
2. __Divide__ by the number of values.

Describes the average value of a data set

17, 20, 14, 18, 16

17+20+14+18+16 = 85

85 ÷ 5 = 17

Think: ____Middle____

To find the **median**:
1. Put the data set in __order__ from least to greatest.
2. Mark off the greatest and least values, starting from the edges until you reach the __middle__.
3. If there are two middle values, add them together and __divide__ by two.

Describes the middle value of a data set

7, 11, 13, 14, 16, 17, 50
7, 11, 13, 14, 16, 17, 50

or

3, 4, 8, 9
(4+8) ÷ 2 = 6

Think: __Most frequent__

To find the **mode**:
Put data set in __order__ from least to greatest.
Find the number that appears the __most__.
There may be __one__ mode, __more__ __than__ one mode, or there may be __no__ mode.

Describes the most frequent value of a data set

8, 11, 12, 18, 18, 20

18

Measures of Spread

Think: __**Spread of data**_____

To find the **range**:

1. Put the data set in __**order**__ from least to greatest.
2. __**Subtract**____ the least value from the greatest value.

Describes the general spread of the data

6, 8, 11, 13, 20, 23

$23 - 6 =$ 17

Think: _**Spread of the middle half**_____

To find the **Interquartile Range (IQR)**:

1. Put data set in ___**order**____ from least to greatest.
2. Find the medians of the __**lower**__ half (Q1) and the __**upper**____ half (Q3) of the data.
3. ___**Subtract**_____ quartile one (Q1) from quartile three (Q3).

Describes the spread of the middle half of the data set

2,4,5,7,8,9,10,12,15,16,18

Lower Quartile (Q1) = 5
Median = 9
Upper Quartile (Q3) = 15

$15 - 5 =$ 10
Q3 − Q1

What a Deal!

Value of cards:

A = 1   2 = 2   3 = 3   4 = 4   5 = 5   6 = 6   7 =7   8 = 8   9 = 9   10 = 10   J = 11   Q = 12   K = 13

Example:
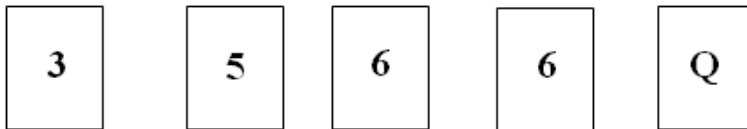
| 3 | | 5 | | 6 | | 6 | | Q |

Range = Q – 3
    $12 - 3 = 9$

Median = 6
    3 5 **6** 6 12

Mode = 6

Mean =
$3 + 5 + 6 + 6 + 12 = 32/5 = 6.4$

What a Deal!

Value of cards:

A = 1   2 = 2   3 = 3   4 = 4   5 = 5   6 = 6   7 = 7   8 = 8   9 = 9   10 = 10   J = 11   Q = 12   K = 13

Score Sheet for <u>What a Deal!</u>

	Player 1	Player 2	Player 3	Player 4	
Names of players	Haley	Susan	Juan	Linda	circle highest value in row
Round 1 Range	8	Range 9	Range (11)	Range 6	→
Mode	(6)	Mode 2	Mode (6)	Mode 1	→ tie
Median	7	Median 3	Median 4	Median (8)	
Mean	5	Mean 4	Mean (8)	Mean 7	

Estimating Heights of Celebrities

Famous Celebrity	Estimated Height in inches	Actual Height in inches	Write these numbers as an ordered pair
Beyoncé Knowles			
Jay Z			
Jennifer Lopez			
J. J. Watt			
Lady Gaga			
Michael Jordan			
Oprah Winfrey			
Selena Gomez			
Shaquille O'Neal			
Taylor Swift			

Beyoncé Knowles

5 ft. 7 in. or 67 inches

Jay Z

6 ft. 2 in. or 74 inches

Jennifer Lopez

5 ft. 5 in. or 65 inches

J. J. Watt

6 ft. 5 in. or 77 inches

Lady Gaga

5 ft. 1 in. or 61 inches

Michael Jordan

6 ft. 6 in. or 78 inches

Oprah Winfrey

5 ft. 7 in. or 67 inches

Selena Gomez

5 ft. 5 in. or 65 inches

Shaquille O'Neal

7 ft. 1 in. or 85 inches

Taylor Swift

5 ft. 10 in. or 70 inches

Scatterplots

- Use the data from the completed table to create a scatter plot. Use the estimated height as the label for the horizontal axis and the actual height as the label for the vertical axis.

- For which celebrity was your estimate closest to the actual height?

- For which celebrity did you have the greatest difference between your estimate and the actual height?

- How well were you able to estimate the heights of the celebrities listed?

- Does there seem to be a relationship between your estimates of the celebrities' heights and their actual heights?

Investigating Data of MLB Pitchers

Each table will be given a roster for the pitchers of a Major League Baseball team.

- What information is listed on the roster?

- What types of graphical representations can be created with the data?

Attributes of MLB Pitchers

At each table, have different groups select a different attribute to investigate.

- Age

- Weight

- Height

Graphical Representations

Each group will create a **dot plot** and a **box plot**, for the numeric data of their selected attribute:

- Age

- Weight

- Height (as fractions – 6'6" would be recorded as 6 ½ feet)

Word Problems

Create one- and two-step problems using data from the graphical representations.

Gallery Walk

- Each group will post their graphical representations and word problems.

- Groups will compare and contrast the different types of graphical representations for each of the different teams.

Handouts available electronically at **https://rusmp.rice.edu/**

$$(\text{THANK YOU})^n$$
$$n \in N, n > 1$$

$$\text{YOU} \in \{Awesome\ People\ Set\}$$

ROMANCEMATHBLOGSPOT.COM

Handouts available electronically at
https://rusmp.rice.edu/