SOL 6.15 – Measures of Center

6.15   The student will
      a)   describe mean as balance point; and
      b)   decide which measure of center is appropriate for a given purpose.

Understanding the Standard:

- Measures of center are types of averages for a data set. They represent numbers that describe a data set. Mean, median, and mode are measures of center that are useful for describing the average for different situations.
  - Mean works well for sets of data with no very high or low numbers.
  - Median is a good choice when data sets have a couple of values much higher or lower than most of the others.   *outliers*
  - Mode is a good descriptor to use when the set of data has some identical values or when data are not conducive to computation of other measures of central tendency, as when working with data in a yes or no survey.

- The mean is the numerical average of the data set and is found by adding the numbers in the data set together and dividing the sum by the number of data pieces in the set.

- In grade 5 mathematics, mean is defined as fair-share.

- Mean can be defined as the point on a number line where the data distribution is balanced. This means that the sum of the distances from the mean of all the points above the mean is equal to the sum of the distances of all the data points below the mean. This is the concept of mean as the balance point.

- Defining mean as balance point is a prerequisite for understanding standard deviation.

- The median is the middle value of a data set in ranked order. If there are an odd number of pieces of data, the median is the middle value in ranked order. If there is an even number of pieces of data, the median is the numerical average of the two middle values.

- The mode is the piece of data that occurs most frequently. If no value occurs more often than any other, there is no mode. If there is more than one value that occurs most often, all these most-frequently-occurring values are modes. When there are exactly two modes, the data set is bimodal

SOL 6.15 – Measures of Center

| Descriptors of Data			
Measures of Central Tendency			
Mean	*Median*	*Mode*	*Range*
Put in **ORDER** least to greatest	Put in **ORDER** least to greatest	Put in **ORDER** least to greatest	Put in **ORDER** least to greatest
Add all numbers then **Divide** by amount of numbers.	**Find** the number in middle If an odd set of #s – only one median If an even set of #s – add the 2 medians and then divide by 2	**Find** the number(s) that occurs most often	**Find** the difference between largest and smallest.
"AVERAGE"	**"MIDDLE"**	**"MOST OFTEN"**	**"DIFFERENCE"**
Best for data close together; **NO** outliers	*Best for* data with very High/Low numbers; **WITH** outliers	*Best for* data that has repeating numbers	*Best for* looking at the spread of data
Only **ONE** answer	Only **ONE** answer (may have to find mean)	May Have **NO** Mode, **ONE** or **MORE** Modes	Only **ONE** answer

SOL 6.15 – Balance Point

On a line plot, move all the X's one unit from each side until they all line up in the middle. This is the balance point or the mean.

Vocabulary:
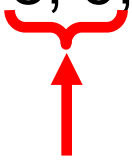
Mean – a measure of central tendency

$$2, 3, 4, 7$$

Balance Point
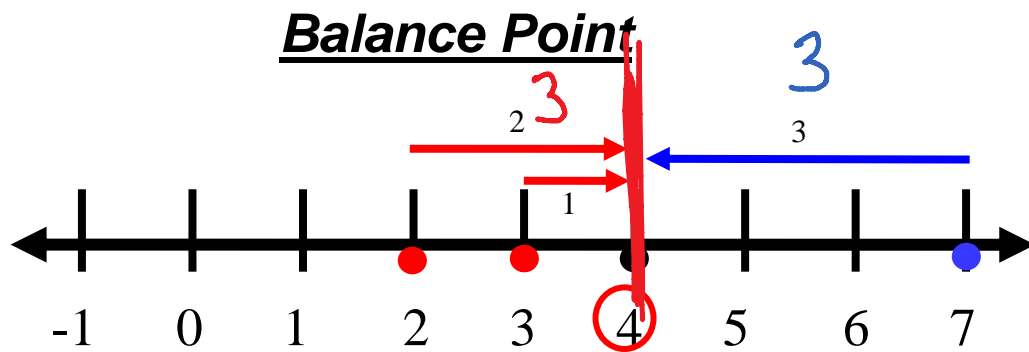
Numerical Average

$$\frac{2+3+4+7}{4} = \frac{16}{4} = 4$$

<u>Median</u> – a measure of central tendency

6, 7, 8, 9, 9	5, 6, 8, 9, 11, 12
↑ 8 = median	↑ 8.5 = median

<u>Mode</u> – a measure of central tendency

Data Sets	Mode
2, 3, 3, 3, 5, 5, 9, 10	3
5.2, 5.4, 5.5, 5.6, 5.8, 5.9, 6.0	none
1, 1, 2, 5, 6, 7, 7, 9, 11, 12	1, 7

bimodal
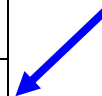
<u>Range</u>

Data set $2\frac{1}{2}$, 3, $3\frac{3}{4}$, $3\frac{7}{8}$, 5, $5\frac{1}{2}$, $9\frac{1}{6}$, $10\frac{4}{5}$, $15\frac{1}{2}$, 20	$20 - 2\frac{1}{2} = 17\frac{1}{2}$	Range = $17\frac{1}{2}$

Essential Understandings:

What does the phrase "measure of center" mean?

This is a collective term for the 3 types of averages for a data set - mean, median, mode

What is meant by mean as balance point?

It is where the data distribution is balanced the sum of the distances above the mean are the same as the distances below the mean

## Essential Knowledge & Skills:

The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to

- Find the mean for a set of data.

- Describe the three measures of center and a situation in which each would best represent a set of data.

- Identify and draw a number line that demonstrates the concept of mean as balance point for a set of data.

Practice:

1. This line plot shows the number of books that a group of students have read. Use this data to determine where on the line plot the mean will appear.

Balance point same as mean (handwritten)

0, 1, 2, 2, 2, 5, 6, 6 (handwritten)

Number of Books Students Have Read
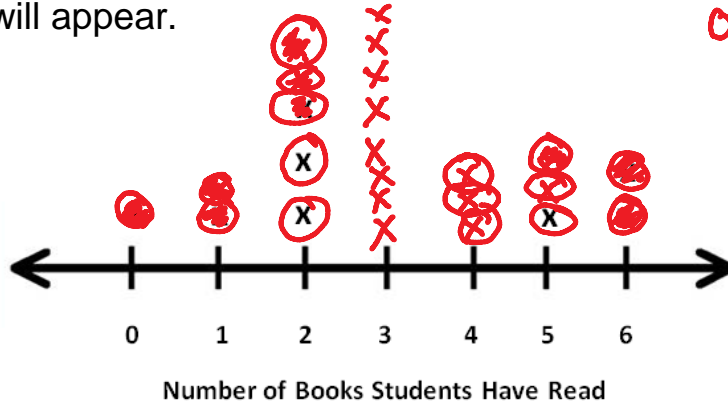
**2.** This data shows the ages of members of a youth book club and the age of the facilitator.

11   12   13   14   15   16   17   [57]   ← *outliers* (handwritten)

median (handwritten)

3. What is the most appropriate measure of center for this data?

4. Jill recorded the number of pull-ups each of ten students did on this line plot. What is the balance point for this data?

1, 1, 2, 3, 3, 8 8 8 8 8 8   *50* (handwritten)

——————————   ——

10   10 (handwritten)

⑤ (handwritten)

Number of Pull-Ups
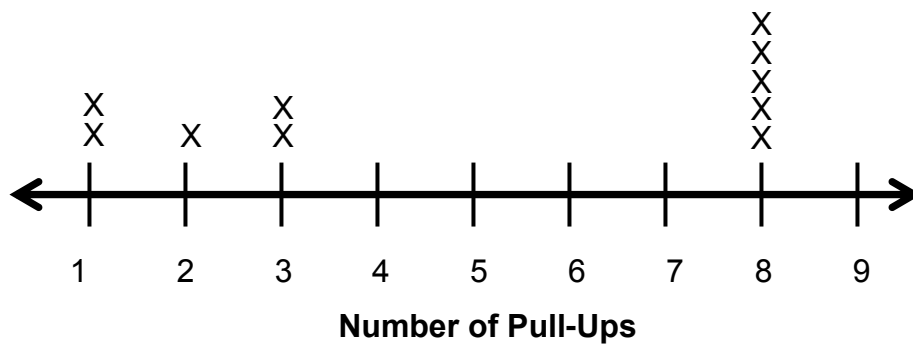
Each X represents 1 student.

5. Andy surveyed his friends to determine the number of books each of them read in February. These are the results of the survey.
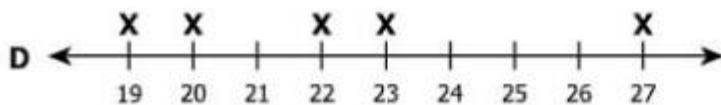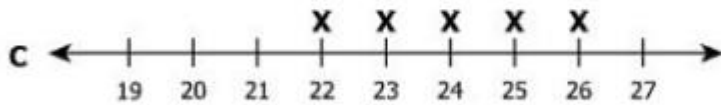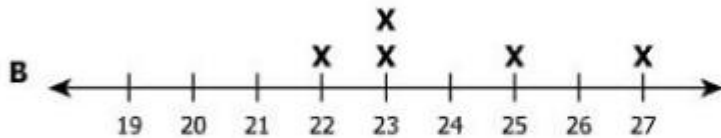
3, 2, 3, 19, 2, 1, 2, 2, 2, 2

1, 2, 2, 2, 2, 2, 2, 3, 3, (19)

a. What is the mean for this data set? $\frac{38}{10} = 3.8$

b. What is the median for this data set? 2

c. Is the mean or median a more appropriate measure of center to use for this data? Why? median, because it has an outlier

Released SOL Questions:

Which line plot shows a set of data with a balance point of 23 ?

A — line plot with X marks at 20, 21, 25, 27 over number line 19–27

B — line plot with X marks at 22, 23(×2), 25, 27 over number line 19–27

C — line plot with X marks at 22, 23, 24, 25, 26 over number line 19–27

D — line plot with X marks at 19, 20, 22, 23, 27 over number line 19–27

This list shows the number of text messages 5 friends sent last week.

outlier → 13, 60, 61, 63, 64

The most appropriate measure of center for this data is the —

A mean because all the numbers are close to one another in value

B median because all the numbers are close to one another in value

C mean because 13 text messages is much lower than the other numbers

D median because 13 text messages is much lower than the other numbers