Activity: Selected Assignments from the May Optional Work Packet

Week: June 15 – June 19

Grade 6

Class Math

Teachers: Ms. Carter, Mr. Dedrick, Ms. Hartley
Ms. K. Ross, Mr. Reed

Key Content/Modeling:
Pearson Topic 8: Display Describe and Summarize Data

- Summarize Data Using Measures of Variability
- Choose Appropriate Statistical Measures
- Summarize Data Distributions

You Try:

- Try-It
- Do You Understand?
- Do You Know How?
- Practice

Show me what you know (Proof of learning):

Complete your work and e-mail pictures (or solutions) to your teachers.

Self-Assessment:

Did I complete all of the tasks?
Did I try my best?

Extra Learning Opportunities:

Find some math in your community! Did you use ratio reasoning for cooking? Did you have to add or subtract decimals when you were shopping? Did you find any ratios in your video games? Tell us about what you've found on e-mail; we'd love to hear all about it! Complete practice problems from the June Family Resource Packet.

Priority Standard(s):

6.SP.A.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

What am I learning?

I can identify, summarize, and display statistical data.

How do I know I learned?

Learning Evidence in 1-3 Descriptors

I fully completed all tasks and checked my answers to make sure they made sense to answer the questions.
Good Morning Students  
Monday June 15, 2020

Today Focus:

- In the May 2020 Family Resource Packet
- Resource Packet Link:  

Learning Target:

- Make Sense of Problems and Persevere in Solving Them
- Construct Viable Arguments
- Model with Mathematics

Special Note:

- Read each example and do your best in completing all work. If you have any questions, are stuck on a problem, or want me to check your work, please email me and I will be sure to get back with you.
- Take a picture of your work and send it via email for all feedback.
- If you are having trouble accessing the resource packet, please let me know so I can work on ways of getting it to you.
- Paper copies of the resource packet are available to pick up at First Creek on Tuesdays and Thursdays at lunch time.
- The June Family Resource Packet is an opportunity to continue practicing all of your skills – it is rife with practice problems that can help you maintain your growth all summer!

Tips & Hints:

- Read the entire problem before beginning to work to an answer.
- What do you know about each problem?
- What’s unknown about each problem (what are you trying to discover)?
- Can you draw a diagram (or picture) to help understand the problem?
- https://youtu.be/pfujiA5Mk_U (Symmetry and Skewness - Simple Learning Pro)
The following pages can also be accessed through your Pearson account

8-5 Summarize Data Using Measures of Variability

**KEY CONCEPT**

The mean absolute deviation and the interquartile range each use a single number to describe the variability, or spread, of a data set. The mean absolute deviation (MAD) tells you how far the data are spread out from the mean. The interquartile range (IQR) tells you how far the middle of the data is spread out from the median.

Measures of Variability are used to describe the spread of a data set. The more spread out the data is, the larger the Measures of Variability will be.
8-5 Example 1

**Example 1**

Find the Mean Absolute Deviation to Describe Variability

Ann is looking at her math quiz scores for one grading period. She wants to know how much her scores varied. She knows that her average (mean) score is 86%. How can Ann determine how much her scores varied during this grading period?

**Model with Math**

You can use a number line to show the spread and clustering of data in relation to the mean.

**STEP 1** Find the differences between each of Ann’s quiz scores and her mean (average) score. Show all differences as positive integers.

- The absolute deviation is the absolute value of the difference between a value and the mean.

<table>
<thead>
<tr>
<th>Score</th>
<th>Absolute Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>82</td>
<td>6</td>
</tr>
<tr>
<td>76</td>
<td>4</td>
</tr>
<tr>
<td>92</td>
<td>2</td>
</tr>
<tr>
<td>88</td>
<td>2</td>
</tr>
</tbody>
</table>

  **Distance From the Mean**

  - **73 - 86** = 13
  - **76 - 86** = 10
  - **92 - 86** = 6
  - **88 - 86** = 2

  **Ann’s mean (average) score is 86%.**

  **Try It!**

  Ann’s vocabulary quiz scores are 75, 81, and 90. The mean score is 82. What is the mean absolute deviation?

  **Convince Me!** Can the mean absolute deviation ever have a negative value? Explain.

**STEP 2** Find the mean of all of the differences, or absolute deviations. This value is called the mean absolute deviation (MAD).

- Add all of the absolute deviations:

  \[ \frac{13 + 10 + 4 + 2 + 2 + 4 + 6 + 13}{8} = \frac{56}{8} = 7.0 \]

- Divide by the number of scores.

  Ann can find the mean absolute deviation (MAD) to determine how much her math quiz scores varied during this grading period.

  Her scores varied by an average of 7.0 points.
8-5 Example 2

Find the Interquartile Range (IQR) to Describe Variability

The dot plot shows Ann’s science quiz scores. How can Ann determine the variability in her science quiz scores?

Draw a box plot to determine the interquartile range.

The interquartile range is 82 – 79 = 3.

So, at least half of Ann’s science quiz scores were within 3 points.

Try It!

The dot plot shows the distribution of Ann’s health quiz scores. How can the IQR describe her scores?

8-5 Example 3

Use the Mean Absolute Deviation (MAD) to Find the Variability of a Data Set

Jonah recorded the points his team scored during its last nine basketball games. The mean number of points scored was 42 and the MAD was 4.4. How can Jonah use these measures to describe the variability of the points his team scored during the last nine games?

The MAD shows that the scores generally varied greatly from the mean. The scores were mostly less than 38 (42 – 4.4 = 37.6) or greater than 46 (42 + 4.4 = 46.4).

Try It!

Jonah’s team scored 36, 37, 38, 38, 41, 46, 47, 47, and 48 points in the last nine games. Find the IQR and range of the points Jonah’s team scored in its last nine games. Are these good measures for describing the points scored?
**Do You Understand?**

1. **Essential Question** How can the variability of data be described using a single number?

2. What does the IQR show that the range does not show?

3. **Reasoning** Two data sets have the same mean. B. However, the MAD of Data Set A is 2 and the MAD of Data Set B is 4. What does this indicate about the variability of the data sets?

**Do You Know How?**

In 4–7, use these data.

Davita works at a shoe store. She measured the feet of nine customers and found that their shoe sizes were 4, 5, 5, 6, 7, 8, 8, 10, and 10.

4. Find the mean.

5. Find the sum of the absolute deviations from the mean.

6. Find the mean absolute deviation. Explain how you found the MAD.

7. Find the range and IQR. How is each calculated?

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**LESSON 8-5  Summarize Data Using Measures of Variability**

**Quick Review**

The **mean absolute deviation (MAD)** describes how spread out data values are from the mean. The **interquartile range (IQR)** describes the difference between the third quartile and the first quartile.

**Example**

Find the MAD of the data set.

6, 7, 8, 8, 8, 11

Mean = 8

The absolute deviations from the mean are 2, 1, 0, 0, 0, and 3, and their sum is 6.

So, \( \text{MAD} = \frac{6}{6} = 1 \).

**Practice**

In 1–3, find the mean and the MAD for each data set.

1. 5, 12, 0, 7

2. 8, 14, 22, 16

3. 1.25, 2.5, 3

In 4 and 5, find the median, first quartile, third quartile, and IQR for each data set.

4. 10, 20, 35, 45, 45, 50

5. 24, 12, 30, 17, 32, 13, 19
There are a lot of ways to represent a full data set using fewer numbers. Four methods of doing that are:

- **Mean**
  - Often referred to as “average”
  - Find the sum of all the terms in your data set, then divide that sum by the number of terms you added together
  - Ex. Find the mean of the data set 4, 13, 5, 7, 12, 21, 4, 12.
    
    \[
    4 + 13 + 5 + 7 + 12 + 21 + 4 + 12 = 78
    \]
    
    \[
    78 \div 8 = 9.75
    \]
  
  The mean of the given data set is 9.75. Why did I divide by 8?

- **Median**
  - Think middle
  - Put the numbers in your data set in order (either ascending or descending), then find the number in the middle.
  - If there are two “middle” numbers, use the mean of those two numbers.
  - Ex. Find the median of the data set 4, 13, 5, 7, 12, 21, 4.
    
    \[
    4, 4, 5, 7, 12, 13, 21
    \]
    
    The median of the data set is 7.
• **Mode**
  - The number that occurs *Most Often* in your data set.
  - A data set may not contain a mode (all the numbers appear the same number of times).
  - A set may have multiple modes if more than one number appears more often than the other numbers and the same amount of times as each other.
  - Ex. Find the mode of the data set 4, 13, 5, 7, 12, 21, 4.

The number 4 appears twice in the data set, all the other numbers only appear once.

The mode is 4.
**Example 1**

Gary reviews the scores on his weekly quizzes. What measure should Gary use to get the best sense of how well he is doing on his weekly quizzes?

**Make Sense and Persevere**
What does the distribution of the data in a dot plot tell you about the shape of the data? [MP1]

Display Gary's scores on a dot plot. Describe the shape of the data. Then find the mean, median, and mode of the data set.

65 is an outlier. It "lies outside" most of the other values in the data set.

The values in the data set are spread out. There are gaps in the values on the dot plot.

The outlier causes the mean to be less than the values of largest group of data. The best measure to use is the median because the outlier does not affect the median.

**Try It!**

If Gary scored a 70 on his next weekly quiz, how would that affect his mean score?

**Convince Me!** Gary says that he usually scores 98 on his weekly quiz. What measure of center did Gary use? Explain.
### Example 2

Choose the Best Measure of Variability to Describe a Data Set

John and Yoshi are computer lab partners. During a spreadsheet project, they decide to enter their French quiz scores on their shared tablet.

**A.** Choose a measure of variability and use it to describe John's quiz scores.

- John's scores contain an outlier, 65, so the median is a better measure of center for his data than the mean.
- Use the IQR when the median is the appropriate measure of center.
  
  - First Quartile = 87
  - Third Quartile = 93
  - $IQR = 93 - 87 = 6$
  - At least half of John's quiz scores are between 87 and 93. This accurately describes how his scores are clustered.

**B.** Choose a measure of variability and use it to describe Yoshi's quiz scores.

- Yoshi's scores range from 80 to 88, so there is no outlier. The mean, 84, is a good measure of center for her data.
- Use the MAD when the mean is the appropriate measure of center.
  
  - $MAD = \frac{|4 - 4| + |2 - 2| + |0 - 2| + |2 - 4| + |4 - 4|}{10} = 2.4$
  - Yoshi's scores are typically within 2.4 points of her mean score of 84.

### Try It!

Suppose the French teacher says that she will drop each student’s lowest quiz score. Would the MAD now be a good measure of variability for John’s quiz scores? Calculate the MAD without John’s lowest score and use it to justify your answer.

John’s lowest score is 

Without the lowest score, John’s mean score is 

\[
MAD = \frac{4 + 4 + 2 + 2 + 0 + 2 + 4 + 4}{9} = \frac{24}{9} = 
\]
Do You Understand?

1. **Essential Question** Why is one statistical measure more useful than another to describe a given situation?

2. **Reasoning** You cannot find a good measure of center for a data set. What is probably true of the data set? *MR.2*

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Do You Know How?

In 3–5, use the basketball team’s scores for one season: 44, 43, 42, 40, 42, 45, 39, 38, 18.

3. Find the mean, median, and mode of the scores.

4. Is the median or mean the best measure of center for these data? Explain.

5. Find the measure of variability that best describes the data set.
8-7 Summarize Data Distributions

A data set is symmetric when it is balanced around a central data point. When a data set has outlying data points (points that are far removed from the central data point and/or all other data points) then that data set will often not be symmetric.
EXAMPLE 1  Summarize a Distribution That Is Symmetric

A science class is testing how different types of fertilizer affect the growth of plants. The dot plot shows the heights of the plants being grown in the science lab. How can you describe the data?

**STEP 1** To describe a data distribution, or how the data values are arranged, look at the overall shape.

![Dot plot of plant heights]

The data are clustered together. The dotted red line shows that the data are roughly symmetric.

**Heights of Plants**

<table>
<thead>
<tr>
<th>Height (cm)</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
</tr>
</thead>
</table>

**STEP 2** Since the data are roughly symmetric, the mean is the best measure of center.

\[
\frac{14 + 15 + 15 + 16 + 16 + 16 + 17 + 17 + 18 + 19}{10} = 16.3
\]

The mean height is 16.3 cm.

Find the mean absolute deviation (MAD).

\[
\frac{2.3 + 1.3 + 0.3 + 0.3 + 0.3 + 0.7 + 0.7 + 1.7 + 2.7}{10} = 1.16
\]

The mean absolute deviation is 1.16 cm, so a typical height is about 1.16 cm from the mean.

**Generalize** Since the mean is the best measure of center, the MAD is the best measure of variability.

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**Try It!**

Does the shape of the distribution match what you found when you used measures of center and variability? Explain.

**Convince Me!** What are some factors that might explain why some plants grew more or less than others in the science lab?
8–7 Example 2

**Summarize a Distribution Shown in a Dot Plot**

The fat content, in grams, was measured for one slice of 24 different 12-inch pizzas. The data are displayed in the dot plot. How can the data be used to describe the fat content of a slice of pizza?

**STEP 1** Look at the distribution of the data in the dot plot.

- There are gaps between 6 and 8, and between 16 and 19.
- Most data points are grouped between 8 and 13.
- The data are not symmetric. They are more spread out to the right.

**STEP 2** Because the data are not symmetric, the mean is not the best measure of center. Use the median and the IQR to describe the data distribution.

\[
\text{Median} = 11 \quad \text{IQR} = 13 - 9.5 = 3.5
\]

The fat content of at least half of the slices is between 9.5 g and 13 g. The typical slice of pizza has a fat content of 11 g.

8–7 Example 3

**Summarize a Distribution Shown in a Box Plot**

The box plot displays data for the number of days the temperature was above 80°F for the month of July. The data were collected over a ten-year period. How can you summarize these data?

First, look at the overall shape. Then find measures of center and variability.

- The data are spread out to the right.
- The median is the center of the data.
- The first quartile is 3 and the third quartile is 22. At least half of the data fall between 3 days and 22 days. The interquartile range is 19 days.
- 25% of the years, the number of days with temperatures above 80°F in July was 3 days or less.

**Try It!**

Why does it make sense to look at the overall shape before deciding which measures to use?
Do You Understand?

1. **Essential Question** How can you summarize a data distribution?

2. **Reasoning** This data set has an outlier: 0, 40, 50, 60, 60, 70, 80, 80. How would the median and the mean be affected if the outlier was removed?  

Do You Know How?

3. Five different students measured the length of a shadow in inches as follows: 38, 38\(\frac{1}{2}\), 37\(\frac{1}{2}\), 38, 38\(\frac{1}{2}\). Make a generalization about the data distribution of the shadow measurements.

4. What are the mean, the median, and the interquartile range of the data set in Exercise 3?

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**Quick Review**

You can summarize data by finding the measure of center and the measure of variability. Use the IQR when the median is an appropriate measure of center, and the MAD when the mean is an appropriate measure of center.

**Example**

Use statistical measures to summarize the data set shown.

**Test Scores**

<table>
<thead>
<tr>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
<th>110</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The mean and MAD are good measures to describe this data set.

The mean test score is 78 points. The MAD is 10.4, so most test scores are within 10.4 points of the mean.

**Practice**

In 1–3, use the data below.

**Game Sales**

<table>
<thead>
<tr>
<th>Number Sold Each Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>64 68 72 76 80 84 88 92 96 100 104</td>
</tr>
</tbody>
</table>

1. Describe the overall shape of the data. Include any outliers.

2. Which measure of center and measure of variability best describe the data set? Explain.

3. Summarize the data set.