

Math 8: Week of May 26

- Go through the slides (notes) and work through the examples on a separate piece of paper.
- Do the given practice problems (again, on a separate piece of paper).
- Check your answers with the key given (last slide).
- Take a photo or scan in your work and submit it in Google Classroom. If you have questions or would like feedback on your work, add that as a comment with your submitted work.
- The other option for turn in is to send it in on Monday when the new packet is available.
- Check your school email/google calendar for online help sessions via Zoom.

Day 1: Slides 2-8 Day 2: Slides 9-15
Day 3: Slides 16-22 Answers on Slides 23-24

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Day 1: DA Lesson 6 Measures of Center

Target: Find the mean, median and mode of data sets.

Vocabulary

Statistics

The process of collecting, displaying and analyzing a set of data.

Measures of Center

Numbers which are commonly used to represent sets of numbers.

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Measures of Center

Mean

The sum of all values, divided by the number of values.

$$\text{Mean} = \frac{\text{Sum of Values}}{\text{Number of Values}}$$

Median

The middle number of an ordered data set. If there are two middle numbers find the mean of those numbers.

Mode

The number or item in a data set which appears most often. A data set may have one mode, no mode or several modes.

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Example 1

Find the mean, median and mode of the data set:

3, 8, 9, 9, 10, 10, 28

Subtotal the numerator before dividing OR push “=” before dividing.

Find the mean.

The mean is 11.

$$\frac{3+8+9+9+10+10+28}{7} = \frac{77}{7} = 11$$

Find the median.

The median is 9.

3, 8, 9, 9, 10, 10, 28

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Find the mode.

The modes are 9 and 10.

Both 9 and 10 appear twice.

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Example 1 Continued...

Find the mean, median and mode of the data set:

17, 8, 10, 15, 19, 2, 9, 12

Find the mean.

The mean is 11.5.

$$\frac{17+8+10+15+19+2+9+12}{8} = \frac{92}{8} = 11.5$$

Find the median. Order the numbers From the lowest to the highest. Ten and twelve are the middle numbers.

2, 8, 9, 10, 12, 15, 17, 19

→ → → ← ← ←

$$\frac{10+12}{2} = 11$$

Find the mean of these numbers.

The median is 11.

No number appears more than any other number. There is no mode.

Find the mode.

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Example 2

Marcus and his friends split some small pizzas. Marcus ate $\frac{1}{3}$ of a pizza. His friends each ate $\frac{3}{4}$, $\frac{2}{3}$ and $\frac{1}{2}$ of a pizza. What fraction of a pizza did each of them have, on average?

The average is the mean.

$$\text{Mean} = \frac{\frac{1}{3} + \frac{3}{4} + \frac{2}{3} + \frac{1}{2}}{4}$$

Change the fractions to a common denominator.

$$\text{Mean} = \frac{\frac{4}{12} + \frac{9}{12} + \frac{8}{12} + \frac{6}{12}}{4}$$

Write 4 as a fraction. Multiply by the reciprocal of the denominator.

$$\frac{27}{12} \div \frac{4}{1} = \frac{27}{12} \cdot \frac{1}{4} = \frac{27}{48} = \frac{9}{16}$$

Each boy ate $\frac{9}{16}$ of a pizza, on average.

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Day 1: L6 Practice Problems

Find the three measures of center.

1. 1, -3, 12, -3, -8, 0, 9, 16 2. $2, -\frac{3}{4}, -2.5, 6, \frac{7}{2}, \frac{19}{4}, -6$
 3. $\frac{3}{16}, \frac{9}{8}, 0, -\frac{1}{8}, -3, \frac{1}{16}, \frac{5}{8}, 1$ 4. $\frac{11}{4}, -\frac{1}{2}, \frac{7}{8}, 2, \frac{7}{8}, 2, -\frac{1}{2}, \frac{11}{4}$

Create a data set with the indicated number of values and given measures of center. Show that your data set works for all measures of center.

5. Five numbers
 Mean = 12, Median = 13,
 Mode = 8
6. Eight numbers
 Mean = 18.5, Median = 18,
 Mode = 16, 22

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Day 1: L6 Practice Problems

7. List six numbers that satisfy each set of conditions. Show that your numbers work.

- a. The mean is less than all but one of the numbers.
 b. The mean is greater than all but one of the numbers.
 c. Would you be able to complete parts a and b if the word "mean" were replaced by the word "median"? Why or why not?

8. Is it possible for the mean to be greater than all of the numbers in a data set? Explain.

End Day 1 ⁸

Day 2:
 DA Lesson 10

Effects of Outliers on Data

Understand the effects of outliers on the mean and median of data sets.

Vocabulary

Outlier

An extreme value that varies greatly from the other values in the data set.

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Effects of Outliers on Data

- When there is an outlier in a data set, the mean is typically affected the most.
- An outlier in a data set has more of an effect on the mean of a data set with only a few numbers than it does on a large data set.



Good to Know!

One really large or really small number in a data set can greatly affect the statistics of the data set. For this reason, it is important to recognize outliers and take them into account when analyzing data.

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Example 1

Use the data set 20, 22, 25, 29, 30. An outlier, 54, is added to the data set. Describe the change to the mean and the median.

Find the original mean. $\frac{20+22+25+29+30}{5} = \frac{126}{5} = 25.2$

Find the new mean after 54 is included in the data set. $\frac{20+22+25+29+30+54}{6} = \frac{180}{6} = 30$

The mean increased by 4.8. 20, 22, 25, 29, 30
 Median = 25

Find the original median. 20, 22, 25, 29, 30, 54
 Median = 27

Find the new median.

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Example 2

Use two data sets: Set A: 50, 54, 58
 Set B: 50, 50, 54, 54, 58, 58

An outlier, 10, is added to each data set. Describe the changes to the mean in each data set.

Find the current mean of data set A. $\frac{50+54+58}{3} = \frac{162}{3} = 54$

Find the new mean after 10 is included in the data set. $\frac{50+54+58+10}{4} = \frac{172}{4} = 43$

The mean decreased by 11.

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Example 2 Continued...

Use two data sets: Set A: 50, 54, 58
 Set B: 50, 50, 54, 54, 58, 58

An outlier, 10, is added to each data set. Describe the changes to the mean in each data set.

Find the current mean of data set B. $\frac{50+50+54+54+58+58}{6} = \frac{324}{6} = 54$

Find the new mean after 10 is included in the data set. $\frac{50+50+54+54+58+58+10}{7} = \frac{334}{7} \approx 47.7$

The mean decreased by approximately 6.3.

The outlier, 10, affected the mean more on Set A (the smaller data set) than on Set B (the larger data set).

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Day 2: L10 Practice Problems

Find the mean and the median for each original data set. Then give the new mean and median after the indicated change is made.

1. Original: 21, 28, 33, 35, 43 2. Original: 53, 55, 55, 56, 59, 64
 Change: Include the number 70 in the data set Change: Include the number 25 in the data set
 Mean = ___ Median = ___ Mean = ___ Median = ___
 New Mean = ___ New Median = ___ New Mean = ___ New Median = ___

3. Which was affected most by the changes in #1 and #2 above: the mean or the median? Explain.

4. Set A: 62, 65, 74 5. Set A: 15, 19, 24, 29, 31, 32, 32
 Set B: 59, 66, 66, 72, 77 Set B: 24, 24, 25, 31
 Mean(A) = ___ Mean(B) = ___ Mean(A) = ___ Mean(B) = ___
 Change: Include the number 35 in both data sets Change: Include the number 60 in both data sets
 New Mean(A) = ___ New Mean(A) = ___
 New Mean(B) = ___ New Mean(B) = ___

6. In #4 and #5 above, which data set's mean changed more when the new number was included? Does the outlier affect the mean of the larger data set or the mean of the smaller data set more?

Day 2: L10 Practice Problems

7. For almost 40 years, New York Yankee Roger Maris held the Major League record for most home runs in a season (61). The data below shows his number of home runs in 10 seasons in the American League:

23, 33, 39, 13, 61, 16, 8, 14, 26, 28

- Find the mean and median of the data set.
- Which number in the data set appears to be an outlier? Find the new mean and median without the outlier included.
- Which measure of center changed the most when the outlier was removed?

8. Babe Ruth hit the following number of home runs in his 15 seasons with the New York Yankees:

54, 59, 35, 41, 46, 25, 47, 60, 54, 46, 49, 46, 41, 34, 22

- What was the mean number of home runs that Babe Ruth hit in 15 seasons?
- About how many home runs would Roger Maris have needed to hit in an 11th season to raise his mean to that of Babe Ruth?

End Day 2 15

Day 3: DA Lesson 11

Strengths and Limitations of Data

Determine which measure of center best represents sets of data.

Example 1

Which measure of center best represents each data set? Why?

- the heights of eighth grade students

The heights of students probably vary only slightly from person to person, with few outliers. The mean would likely represent the data set well.

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Example 1 continued...

Which measure of center best represents each data set? Why?

- the shoe sizes of students in a class

There are probably no outliers in this data set. Since shoe sizes come in half-size intervals, the mean may not represent the data well. The median or the mode would likely best represent this data.

- the number of people in each city in New York state

Since there is one very large outlier (New York City with over 8 million people), that would greatly affect the mean. The median would be the best measure of center for this data set.

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Example 2

Find the mean, median and mode of the data set. Determine which measure of center best represents each data set.

- 6, 9, 6, 7, 10, 3, 5, 10, 6, 9, 9, 8

Mean: $\frac{88}{12} = 7.\bar{3}$ Median: 7.5 Mode: 6, 9

This data has 2 modes. The mode is not the best measure of center to represent this data. The mean or the median represent the data well.

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Example 2 Continued...

Find the mean, median and mode of the data set.
Determine which measure of center best represents each data set.

b. 7, 10, 7, 2, 9, 9, 10, 9, 7, 8, 8, 9

Mean: $\frac{95}{12} \approx 7.92$ Median: 8.5 Mode: 9

This data set has an outlier (2). Therefore, the mean is not the best measure of center. The median and the mode best represent the data.

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Example 2 Continued...

Find the mean, median and mode of the data set.
Determine which measure of center best represents each data set.

c. 10, 10, 8, 10, 7, 10, 10, 9, 8, 10, 10, 10

Mean: $\frac{112}{12} = 9.\bar{3}$ Median: 10 Mode: 10

All three measures represents this data well. When there is a large number of values that are the same, the mode is a better choice. The mode of 10 may be the best representation of this data set.

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Day 3: L11 Practice Problems:

1. Nick was looking for apartments in two different communities. The cost for various apartments in the two communities is shown below.

Community A: \$605, \$610, \$620, \$625, \$640, \$650

Community B: \$640, \$680, \$580, \$620, \$700, \$530

- Find the mean apartment price for each community. How do they compare?
- Find the range of the apartment prices for each community.
- Why is only comparing the means of the data sets misleading?

Find the mean, median, and mode of each data set. State which measure of center best represents each data set. Explain your choice.

2. 7, 7, 9, 13, 14, 15, 19 3. 85, 82, 85, 79, 43, 82

4. 18, 12, 18, 18, 18, 19, 18, 18 5. 48, 55, 47, 44, 49, 96, 46

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Day 3: L11 Practice Problems:

Which measure of center would best represent each data set? Explain your choice.

- the height of the ten tallest mountains in Oregon
- the number of computers sold daily during one week at an electronics store
- the number of computers each student in your class has at home
- the number of daily visitors to the zoo during one week in July
- Mitch has the following scores on five tests this term:
82, 82, 100, 85, 86
 - What are the measures of center for Mitch's scores?
 - What is misleading about his mean?
 - Which measure of center could be used to show that Mitch still has room for improvement? Explain.

End Day 3 22

Answer Page

Day 2:
1. Mean = 32, Median = 33, New Mean = 3.38, New Median = 34
2. Mean = 57, Median = 55.5, New Mean = 52.48, New Median = 56
3. The mean. The mean increased by 6.3 in #1 and decreased by 4.52 in #2
4. Mean(Set A) = 67, Mean(Set B) = 68, New Mean(A) = 59, New Mean(B) = 62.5
5. Mean(A) = 26, Mean(B) = 26, New Mean(A) = 30.25, New Mean(B) = 32.8
6. In #4, the mean of set A changed most. In #5, the mean of set B changed most. The mean of the smaller data set is affected most by the outlier.
7. a. Mean = 26.1; Median = 24.5; b. 61; New Mean ≈ 22.2; New Median = 23; c. Mean ≈ 43.9; b. About 222 home runs

Day 1:
1. Mean = 3, Median = 0.5, Mode = -3
2. Mean = 1, Median = 2, Mode = None
3. Mean = $\frac{25}{4}$, Median = $\frac{8}{2}$, Mode = None
4. Mean = $\frac{35}{4}$, Median = $\frac{16}{2}$, Mode = None
5. (Answers may vary)
6. Possible answer: 8, 8, 13, 14, 17
7. a. (Answers may vary) Possible answer: 10, 12, 16, 16, 20, 22, 22, 30
b. (Answers may vary) Possible answer: 5, 16, 16, 17, 18, 18; Mean = 15
8. No: (Answers may vary) Mean has to be somewhere between the maximum and minimum.
c. No: Half the numbers would be less than the median and half would be larger.

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Answer Page

Day 3:
1. a. Comm A = \$625; Comm B = \$625 The means are the same. b. Comm A = \$45; Comm B = \$170
c. The means might be the same; ranges could be very different.
2. Mean = 12; Median = 13; Mode = 7 No outliers so the mean may be best.
3. Mean = 76; Median = 82; Mode = 18 Since 18 shows up a lot, median or mode would be best.
4. Mean = 17.375; Median = 82; Mode = 18 One outlier, no mode; median would be best.
5. Mean = 55; Median = 48; Mode = None One outlier, no mode; median would be best.
6. Likely no outliers, so mean might be best.
7. Depending on whether there are outliers, the mean or median.
8. Mode or median. There may be an outlier.
9. Saturdays might be especially busy (an outlier) so the median might be the best.
10. a. Mean = 87; Median = 85; Mode = 82 b. Only one score (100, an outlier) above the mean. c. Mode. The score he had the most was his lowest score.

MATH 8: FINAL SLIDE for this week!

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