Indicators 34-35 Class Notes by Mrs. Joshi

Mean, Median, Mode, Range

Key Idea

Mean

Words The **mean** of a data set is the sum of the data divided by the number of data values.

Numbers Data: 8, 5, 6, 9 Mean: $\frac{8+5+6+9}{4} = \frac{28}{4} = 7$

4 data values

EXAMPLE 1 Standardized Test Practice

Text Messages Sent
Mark: 120
Laura: 95
Stacy: 101
Josh: 125
Kevin: 82
Maria: 108
Manny: 90

The table shows the number of text messages sent by a group of friends over one week. What is the mean number of messages sent?

Ⓐ 100 Ⓑ 102 Ⓒ 103 Ⓓ 104

$$\text{mean} = \frac{120 + 95 + 101 + 125 + 82 + 108 + 90}{7} = \frac{721}{7}, \text{ or } 103$$

Sum of the data

Number of values

Simplify.

∴ The mean number of text messages sent is 103. The correct answer is Ⓒ.

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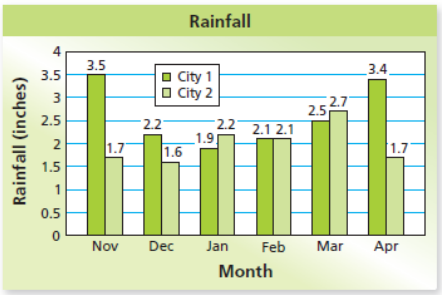
EXAMPLE 2 Comparing Means

Reading
A mean is a type of average.

The double bar graph shows the monthly rainfall amounts for two cities over a six-month period. Compare the mean monthly rainfalls.



City 1 mean: $\frac{3.5 + 2.2 + 1.9 + 2.1 + 2.5 + 3.4}{6} = \frac{15.6}{6}$, or 2.6

City 2 mean: $\frac{1.7 + 1.6 + 2.2 + 2.1 + 2.7 + 1.7}{6} = \frac{12}{6}$, or 2

∴ Because 2.6 is greater than 2, City 1 averaged more rainfall.

An **outlier** is a data value that is much greater or much less than the other values. When included in a data set, it can affect the mean.

EXAMPLE 3 Finding a Mean With and Without an Outlier

Shetland Pony Heights (in.)				
40	37	39	40	42
38	38	37	28	40

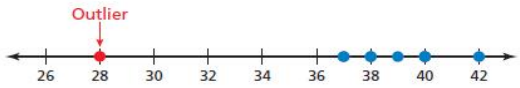
The table shows the heights of several Shetland ponies.

a. Identify the outlier.

b. Find the mean with and without the outlier.

c. Describe how the outlier affects the mean.

a. Graph the heights on a number line.



The height of 28 inches is very low compared to the other heights. So, it is an outlier.

b. Mean with outlier:

$$\frac{40 + 37 + 39 + 40 + 42 + 38 + 38 + 37 + 28 + 40}{10} = \frac{379}{10}, \text{ or } 37.9$$

Mean without outlier:

$$\frac{40 + 37 + 39 + 40 + 42 + 38 + 38 + 37 + 40}{9} = \frac{351}{9}, \text{ or } 39$$

c. With the outlier, the mean is less than all but three of the heights. Without the outlier, the mean better represents the heights.

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Median, Mode, and Range

A **measure of central tendency** is a measure that represents the *center* of a data set. The mean is one type of measure of central tendency. Here are two others.

Key Ideas

Median

Words Order the data. For a set with an odd number of values, the **median** is the middle value. For a set with an even number of values, the **median** is the mean of the two middle values.

Numbers **Data:** 5, 8, 9, 12, 14 The median is 9.

Data: 2, 3, 5, 7, 10, 11

The median is $\frac{5 + 7}{2}$, or 6.

Mode

Words The **mode** of a data set is the value or values that occur most often. Data can have one mode, more than one mode, or no mode. When all values occur only once, there is no mode.

Numbers **Data:** 11, 13, 15, 15, 18, 21, 24, 24

The modes are 15 and 24.

EXAMPLE 1 **Finding the Median and Mode**

Bowling Scores				
120	135	160	125	90
205	160	175	105	145

Find the median and mode of the bowling scores.

90, 105, 120, 125, 135, 145, 160, 160, 175, 205 Order the data.

Median: $\frac{135 + 145}{2} = \frac{280}{2}$, or 140 Add the two middle values and divide by 2.

Mode: 90, 105, 120, 125, 135, 145, 160, 160, 175, 205

The value 160 occurs most often.

∴ The median is 140. The mode is 160.

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EXAMPLE 2 Finding the Mode

Favorite Types of Movies

Comedy	Drama	Horror
Horror	Drama	Horror
Comedy	Comedy	Action
Action	Comedy	Action
Horror	Drama	Comedy
Comedy	Comedy	Horror
Horror	Comedy	Action
Horror	Action	Drama

The list shows the favorite types of movie for students in a class. Organize the data in a frequency table. Then find the mode.

Type	Tally	Frequency
Action	𝍸	5
Comedy	𝍸 III	8
Drama	IIII	4
Horror	𝍸 II	7

The number of tally marks is the frequency.

Make a tally for each vote.

Comedy received the most votes.

∴ So, the mode is comedy.

The **range** of a data set is the difference between the greatest value and the least value. The range describes how spread out the data are.

EXAMPLE 3 Standardized Test Practice

Snake	Record Length (inches)
Copperhead	53
Cottonmouth	74.5
Diamondback rattlesnake	96
Timber rattlesnake	74.5
Pygmy rattlesnake	31
Coral snake	47.5

The table shows the record lengths of six venomous snakes. What is the range of the lengths?

Ⓐ 43.5 inches Ⓑ 48.5 inches

Ⓒ 65 inches Ⓓ 74.5 inches

31, 47.5, 53, 74.5, 74.5, 96 Order the data from least to greatest.

The least value is 31. The greatest value is 96. So, the range is 96 − 31, or 65 inches.

∴ The correct answer is Ⓒ.

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Analysis of Mean

- **What you *can* determine from the mean**
  - if numbers are above or below the mean.
  - this measure can be drastically affected by the addition or deletion of numbers to the data
- **What you *cannot* determine**
  - if there were any outliers – outliers will substantially distort the data either too high or too low.
  - what individual scores were
- **This is usually the best choice to describe data unless there is an outlier.**

Analysis of Median

- **What you *can* determine from the median**
  - if numbers are above or below the halfway point.
  - this measure is the least affected measurement if new numbers are added to the data
- **What you *cannot* determine**
  - if there were any outliers
  - what individual scores were
- **This is usually the best choice to describe data if there is an outlier.**

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Analysis of Mode

- **What you *can* determine from the mode**
  - Which number or numbers are there the most frequently
- **What you *can't* determine from the mode**
  - Where the number is in the group of data
  - What all the other numbers are
- **This is usually the best choice to describe data if you want to select the most popular value or item.**

Analysis of Range

- **What you *can* determine from the range**
  - How far apart the numbers are
- **What you *can't* determine from the range**
  - What the numbers are in the data set
- **This is usually the best choice to describe data if you want to know the spread of the data.**

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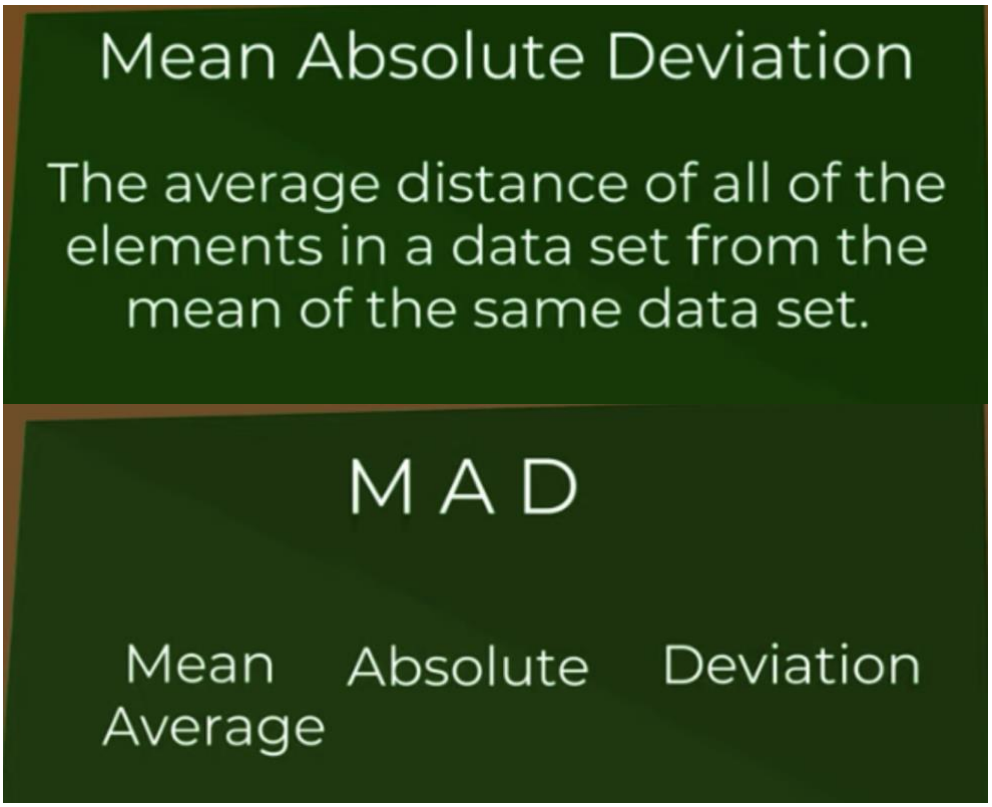

How to find mean absolute deviation

To calculate the mean absolute deviation of a data set, follow these steps:

1. Calculate the mean.
2. Calculate the distance each data point is from the mean.
3. Calculate the mean of those distances.

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Mean Absolute Deviation

Find the MAD of the average number of sunny days each month for Sunnyville

25, 15, 20, 17, 22, 28, 27

Mean Absolute Deviation

Step 1. Find the mean of the data set.

Add of the elements of the data set

Mean Absolute Deviation

$$\frac{\text{Add of the elements of the data set}}{\text{\# of elements in the data set}}$$

$25 + 15 + 20 + 17 + 22 + 28 + 27 = 154$

$$\frac{154}{7}$$

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Mean Absolute Deviation

Step 2. Calculate how far each element is away from the mean. Use the absolute value because distance is always positive.

25 -22 = |3|	3
15 -22 = |-7|	7
20 -22 = |-2|	2
17 -22 = |-5|	5
22 -22 = |0|	0
28 -22 = |6|	6
27 -22 = |5|	5
	28

25 -22 = |3|	3
15 -22 = |-7|	7
20 -22 = |-2|	2
17 -22 = |-5|	5
22 -22 = |0|	0
28 -22 = |6|	6
27 -22 = |5|	5

$$\frac{28}{7} = 4$$

** The 7 is the number of elements in the data set

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25 -22 = |3 | 3
15 -22 = |-7 | 7
20 -22 = |-2 | 2
17 -22 = |-5 | 5
22 -22 = |0 | 0
28 -22 = |6 | 6
27 -22 = |5 | 5

$\frac{28}{7} = 4$

MAD = 4

** The 7 is the number of elements in the data set

The MAD indicates how spread out your data set is.

$\frac{28}{7} = 4$

MAD = 4