

Key Concepts



Measures of Central Tendency

Objective Teach students to use the mean, median, and mode as measures of central tendency.

Note to the Teacher *The terms mean, median, and mode are referred to as “measures of central tendency” because they are the center of the data or the most typical case. The members of the set of data tend to revolve about these numbers. In a sense, they summarize the data. Be sure to explain to students that some information is lost when summarizing a set of data by a single number, but the advantage is we can think about only this number, not the entire set of data.*

Collections of Numbers

Often we are given sets of numbers to analyze in order to make a decision. Here are some examples.

- Sarah is traveling to Hawaii in March. She needs to decide whether to pack a coat. The lowest temperatures recorded in Hawaii in March over the last ten years are listed below.

68°, 70°, 65°, 72°, 63°, 74°, 70°, 69°, 68°, 64°

If the low temperatures are high enough, she will not need to pack a coat. If the low temperatures are too low, she will need to pack a coat.

- Travis is the produce manager at a grocery store. He needs to decide how many pounds of apples to purchase for next week. The list shows how many pounds of apples he has sold each week for the last eight weeks.

110, 115, 98, 136, 114, 105, 124, 131

Travis needs to estimate how many pounds of apples he will sell next week so that he can order an appropriate amount. If he orders too many apples, he will have a surplus. If he orders too few apples, he will have a shortage.

Ask, “How can we use measures of central tendency to make these types of decisions?”

Measures of Central Tendency

In both of the examples on the previous page, we need to summarize the set of data by representing it with a single number. We can then use that number to predict what will happen so that we can make a decision. In the first example, we need to predict the temperature so that we can decide whether to pack a coat. In the second example, we must predict how many pounds of apples will be sold so that we can try to avoid a shortage or surplus.

Key Idea	Use a single number to summarize a set of data. Then use this number to predict what will happen so that you can make a decision.
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There are three ways to summarize a set of data. The first is the **mean**.

Definition of Mean	The sum of the data divided by the number of pieces of data. The mean is also called the average.
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Example 1 Refer to the temperature data for Hawaii. Find the mean of the set of data. Then determine whether Sarah needs to pack a coat.

Solution
$$\frac{68 + 70 + 65 + 72 + 63 + 74 + 70 + 69 + 68 + 64}{10} = \frac{683}{10} \text{ or } 68.3$$

The mean is 68.3. This tells us that the lowest temperature on any day in Hawaii in March is about 68.3 degrees. So, Sarah probably does not need to pack a coat.

Example 2 Refer to the produce data. Find the mean of the set of data. Then determine how many pounds of apples Travis should order.

Solution
$$\frac{110 + 115 + 98 + 136 + 114 + 105 + 124 + 131}{8} = \frac{933}{8} \text{ or } 116.625$$

The mean is 116.625. That is, an average of about 116 pounds of apples was sold each week. So, Travis should order about 116 pounds of apples.

Note to the Teacher *It is now a good time to have the class work some examples. Have them write their own sets of data. Then instruct them to determine the mean of each data set. Be sure to have students save their sets of data so they can later find the medians and modes of the sets.*

The second number we use to summarize a set of data is called the **median**.

Definition of Median	The number in the middle when the data are arranged in numerical order. When there are two middle numbers, the median is their mean.
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Example 3 Find the median of the data set {3, 1, 5, 8, 9, 10, 14}.

Solution Arrange the numbers in numerical order.

1, 3, 5, 8, 9, 10, 14
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The middle number is 8. So, the median is 8.

Example 4 Find the median of the data set {4, 2, 7, 1, 9, 6}.

Solution Arrange the numbers in numerical order.

1, 2, 4, 6, 7, 9
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There are two middle numbers. So, the median is the mean of the two numbers.

$$\frac{4 + 6}{2} = \frac{10}{2} \text{ or } 5$$

The median is 5.

Note to the Teacher *Now have the students find the medians of the sets of data they made earlier. Have them compare each result with the corresponding mean. Point out that the mean and median may or may not be the same number.*

The last number we use to summarize a set of data is the **mode**.

Definition of Mode	The number that occurs most often.
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Note to the Teacher Explain that a set of data may fail to have a mode if there is no member that appears more frequently than any other. For example, if each member occurs only once, there is no mode.

Example 5 Find the mode of the data set {1, 4, 3, 5, 3, 6, 8, 3, 4, 9}.

Solution Count the number of occurrences of each number. The numbers 1, 5, 6, 8, and 9 all occur once, 3 occurs three times, and 4 occurs twice. Since 3 occurs most often, it is the mode.

Example 6 What is the mode of the data set {1, 1, 2, 3, 4, 5, 5, 6, 7}?


Solution The numbers 1 and 5 each occur twice, and the numbers 2, 3, 4, 6, and 7 each occur once. So, the set has two modes, 1 and 5.

Note to the Teacher Have the students find the mode for each set of data they made earlier. Then, for each set of data, have them compare the mean, median, and mode. Conclude the lesson by having the students complete the following exercises.

Exercises

Find the mean, median, and mode for each set of data.

- 8, 6, 12, 4, 5 **7; 6; none**
- 24, 24, 24, 24, 11, 11, 11, 11 **17.5; 17.5; 24, 11**
- 2.1, 5.21, 1.6, 7.4, 13.9, 3.9 **5.685; 4.555, none**
- 24, 27, 27, 31, 32, 36, 36, 36, 39, 40, 50, 58, 58 **38; 36; 36**
- 12, 8, 7, 14, 10, 9, 10, 11, 10, 8, 9, 6 **9.5; 9.5; 10**



End of
Lesson