Mean, Median, Mode and Range

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[Figure 1]

An amusement park is designing a new section for children over 3 years old and under 8 years old. As part of their research, they used a survey of the heights and weights of a thousand children in that age group. Which measure of central tendency should they use to accommodate the greatest number of children on a roller coaster?

In this concept, you will learn to understand Measures of Central Tendency by finding the mean, median, mode and range of a data set.

Statistical Measures

In the real world, there are many situations in which a large group of data is collected. In order to make sense of the data, **statistical measures** are used. These measures help to generalize a group of data, make inferences about it, and compare it with other groups of data.

Statistical measures include **mean, median, mode** and **range**. Depending on the situation, certain measures may be more helpful than others in interpreting data. The mean, median, and mode are three common **measures of central tendency**; they are three mathematical tools frequently used to analyze data.

The **mean**, commonly referred to as the average, is the sum of all the data items divided by the number of data items.

The **median** is the middle number in a set of data that is ordered from least to greatest. If there is an even number of data, you take the average of the middle two numbers to find the median.

The **mode** is the number that occurs most often.

Let's look at an example.

A manager at a small movie theater was analyzing the number of people who came to the movies during the week. Over nine days, he found the following data: 81, 89, 92, 85, 93, 62, 85, 105, and 90. Find the mean, median, and mode of the data.

First, find the mean. Remember that the mean is the same as the average. To find the mean you must add all of the data items and divide by the number of items.

$$
\begin{aligned}
\text{mean} &= \frac{81+89+92+85+93+62+85+105+90}{9} \\
&= \frac{782}{9} \\
&= 86.8
\end{aligned}
$$

Next, find the median. The median is the middle number when the data is ordered from lowest to highest. When you reorder the data from least to greatest you get:

$$62, 81, 85, 85, 89, 90, 92, 93, 105$$
$$\uparrow$$

The middle number, 89, is the median.

Next, find the mode. The mode is the number that occurs most often.

In this case, 85 occurs two times and all of the other numbers only once.

The number 85 is the mode.

The answer is that the mean is 87 (rounded up since you are finding the mean number of people), the median is 89 and the mode is 85.

Examples

Example 1

Earlier, you were given a problem about the new section of the amusement park.

In order to attract more customers, they should accommodate as many children as possible. For this reason, they should use the range which will include heights of children from the shortest to the tallest.

Example 2

Find the mean, median, mode and range of the following data set.

12, 13, 15, 18, 22, 25, 30, 31, 32, 34, 40

First, find the mean. To find the mean you must add all of the data items and divide by the number of items.

$$
\begin{aligned}
\text{mean} &= \frac{12+13+15+18+22+25+30+31+32+34+40}{11} \\
&= \frac{272}{11} \\
&= 24.73
\end{aligned}
$$

Next, find the median. The median is the middle number when the data is ordered from lowest to highest. When you reorder the data from least to greatest you get:

$$12, 13, 15, 18, 22, 25, 30, 31, 32, 34, 40$$
$$\uparrow$$

The middle number, 25, is the median.

Next, find the mode. The mode is the number that occurs most often.

In this case, there is no number that occurs more often.

There is no mode.

Then, find the range. The range is the largest number minus the smallest number in the data set.

$$
\begin{aligned}
\text{range} &= 40 - 12 \\
&= 28
\end{aligned}
$$

The answer is that the mean is 24.73, the median is 25, there is no mode, and the range is 28.

Given the following data set, answer the questions found in the examples below.

7, 9, 3, 5, 11, 1, 8, 6, 1, 5

Example 3

Find the mean of the data set.

To find the mean you must add all of the data items and divide by the number of items.

$$
\begin{aligned}
\text{mean} &= \frac{7+9+3+5+11+1+8+6+1+5}{10} \\
&= \frac{56}{10} \\
&= 5.6
\end{aligned}
$$

The answer is 5.6.

Therefore the mean for this data set is 5.6.

Example 4

Find the median of the data set.

To find the median you must order the data set from lowest to highest. When you reorder the data from least to greatest you get:

$$1, 1, 3, 5, 5, 6, 7, 8, 9, 11$$
$$\uparrow$$

The middle number is between 5 and 6. Therefore you need to take the average of these two numbers.

$$\frac{5+6}{2} = 5.5$$

The answer is 5.5.

Therefore the median is 5.5.

Example 5

Find the mode of the data set.

To find the mode you need to find the number that occurs most often.

In this case, both 1 and 5 occur twice.

Therefore, the data set is **bimodal** (two modes) with modes of 1 and 5.

The answer is 1 and 5.

Review

Find the mean, median, mode and range. Round all answers to the nearest tenths place. Notice that each problem has four answers.

13, 18, 24, 21, 16, 24, 14, 17, 24

1. Mean

2. Median

3. Mode

4. Range

116, 137, 120, 75, 98, 98, 137, 139, 139

5. Mean

6. Median

7. Mode

8. Range

22, 24, 25, 30, 32, 34, 37, 22, 22, 38, 40

9. Mean

10. Median

11. Mode

12. Range

123, 150, 163, 150, 163, 150, 180, 200, 201
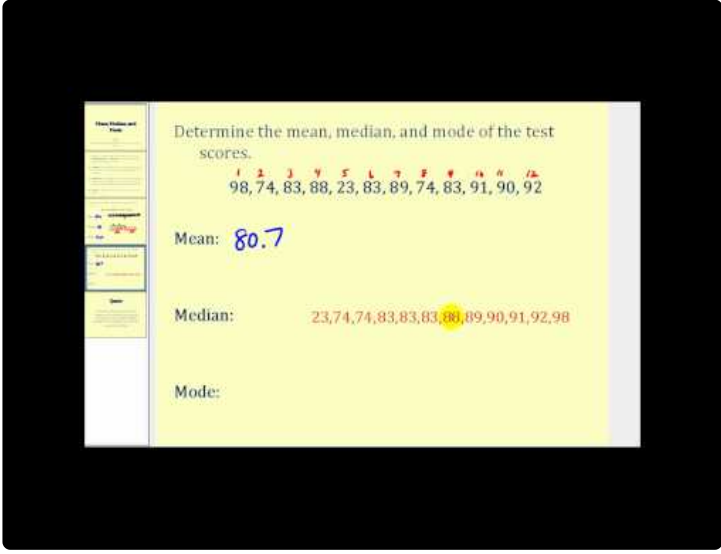
13. Mean

14. Median

15. Mode

16. Range

Review (Answers)

To see the review answers, return to the Table of Contents and select 'Other Versions' or 'Resources'.

Resources

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