

# 12.5

## Choose the Best Measure of Central Tendency

### Focus on...

After this lesson, you will be able to...

- determine when to use the mean, median, or mode to best describe a set of data
- solve problems using mean, median, and mode



The table below shows school T-shirt sales for the past ten weeks. The school wants to make one more order for the next 30 weeks. How could the school decide how many T-shirts to order?

Date	Sept 10	Sept 17	Sept 24	Oct 1	Oct 8	Oct 15	Oct 22	Oct 29	Nov 5	Nov 12
Sales	7	50	8	9	10	12	7	7	9	11

### Discuss the Math

#### Which measure of central tendency is most appropriate?

1. What are the mean, median, mode, and range of the T-shirt data shown above?
2. Compare the mean, median, and mode. Which measure seems to best represent the ten numbers? Explain.
3. Share your answer from #2 with a classmate. Do your answers agree? If not, explain the reasons for your selection.
4. How many T-shirts should be purchased for the next 30 weeks? Explain your thinking.

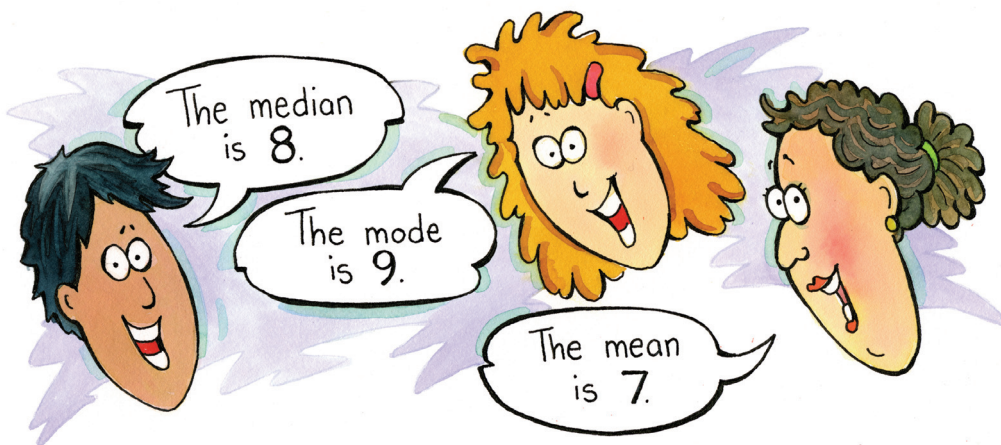
## Reflect on Your Findings

5. a) Why do you think the sales in the second week were so high compared to the other nine weeks?
- b) Which measure of central tendency was most affected by the large number of sales in the second week?
- c) Which measure of central tendency do you think is not a good measure of the centre of these data? Explain why.

### Example 1: Compare Measures of Central Tendency

Amir and Melanie's weekly quiz scores were 4, 5, 8, 9, 9.

Which measure(s) of central tendency best describe the data? Explain why.



### Solution

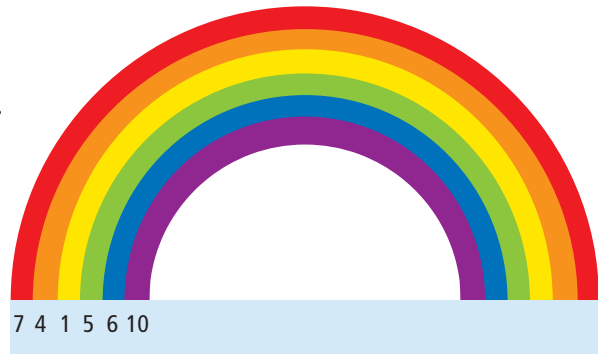
Since the mode represents the highest score, it is not the best representation of the five scores. The other two measures, median and mean, are both acceptable.

### Show You Know

- a) What are the mean, median, and mode for the following data set? Round your answers to the nearest tenth, if necessary.  
16, 53, 14, 16, 11, 11, 12, 13, 11
- b) Which measure(s) of central tendency best describe the data? Explain.

## Example 2: Choose Mode as the Best Measure of Central Tendency

Students have taken a vote on the new official school colours for sports uniforms. The number of votes for each colour is shown. Which measure of central tendency would you use to decide the winning colour?



### Solution

The data collected involve the frequency of colour choices. The most popular choice wins.

In this case, the median and mean do not provide any meaningful information about colour choice. The best measure to use is the mode. The mode is purple since purple is the most popular choice.

## Example 3: Compare Median and Mean

Suki paid the following amounts for her last six pairs of jeans before tax:

\$44, \$38, \$45, \$49, \$125, \$50

- What are the median and the mean jean prices?
- Which measure of central tendency best describes these data?

### Solution

- Arrange the numbers in order. The median is the middle value.  
~~38~~ ~~44~~ 45 49 ~~50~~ ~~125~~  
The median is halfway between the values of 45 and 49 at 47.  
The median price is \$47.00.

$$\begin{aligned}\text{Mean} &= \frac{38 + 44 + 45 + 49 + 50 + 125}{6} \\ &= 58.50\end{aligned}$$

The mean price is \$58.50.

The number of pairs of jeans is 6.

- The value of \$125 is very different from the other five values. The single value, \$125, alters the mean much more than the median. The median is a better measure of central tendency for the six prices.

## Key Ideas

- The mode is the best measure of central tendency for data that represent frequency of choice such as favourite colour, clothing and shoe sizes, or most popular musical group.
- If all the numbers in a set of data are relatively close together, either the median or mean can be used as a measure of central tendency.
- If a data set contains unusually large or small numbers relative to the rest of the data, the median is usually the best measure of central tendency.

### Communicate the Ideas

1. A group of adults were asked to choose their favourite female singer: Sarah McLachlan, Hillary Duff, Avril Lavigne, Shania Twain, or Celine Dion. Which measure of central tendency would best represent the data? Explain why.
2. A student recorded the following hours of volunteer work for each of the past ten months:  
23, 18, 21, 19, 23, 24, 84, 22, 20, 16  
Determine the median and mean. Which measure of central tendency better represents the data? Explain why.

### Practise

*Round all answers to one decimal place unless otherwise specified.*

*For help with #3, refer to Example 1 on page 447.*

3. Min recorded the number of baskets she made out of ten attempts during each basketball practice. After nine practices, her results were:  
4, 7, 5, 6, 3, 7, 2, 3, 7
  - a) What are the median, mode, and mean?
  - b) Which measure of central tendency best describes these data? Explain why.





For help with #4 and #5, refer to Example 2 on page 448.

4. Which measure of central tendency best represents the following data? What is its value?

Favourite Hockey Player	Number of Votes
Sidney Crosby	8
Jarome Iginla	5
Alexander Ovechkin	8
Ryan Smyth	7

5. The following tally chart represents the sizes of running shoes that were sold last Saturday.



Size	7	8	9	10
Number Sold	###	###		

- a) What are the mean and the mode size of shoe?  
 b) If you are restocking the shoes at the end of the day, which measure of central tendency is more meaningful? Why?

For help with # 6 and #7, refer to Example 3 on page 448.

6. A realtor in Rainbow Town sold the following houses in the past month.

House Description	Selling Price
Red starter house	\$80 000
Blue house	\$140 000
Green house	\$145 000
Grey house	\$150 000
Pink mansion	\$2 100 000

- a) What are the median and mean?  
 b) Which measure of central tendency is more representative of the house prices in Rainbow Town?

7. In a grade 5 class, 16 students are 10 years old, 2 students are 9 years old, and 2 students are 11 years old. The teacher and her assistant are both 50 years old.
- a) What are the mean, median, and mode ages of all students and teachers?  
 b) Which measure(s) of central tendency best describes the data? Explain why.

### Apply

8. The following table shows survey results for the percent of radio listening time by music type among 100 Canadian teens.

Music Type	Listening Time (%)
Pop	19.0
Contemporary rock	31.0
Rap	14.7
Album rock	10.6
Country	8.7
Other	16.0

Which single music type best represents Canadian teenagers? Which measure of central tendency did you use to find your answer? Explain why.



9. Juan's Cleaners had developed a new disinfectant to kill germs. Ten tests were performed with the following results. Percent of germs eliminated: 67, 99, 91, 87, 99, 70, 99, 69, 92, 61
- a) If you were the owner of the company, which measure of central tendency would you use for advertising? Why?  
 b) If you were working for the Centre for Disease Control, which measure of central tendency would be best for the public to use in evaluating the product? Why?

10. A school held a canned food drive for holiday season food baskets in their community. The following numbers of cans were collected.

Grade	Number of Students	Total Cans Collected
1	20	100
2	24	96
3	22	99
4	20	120
5	18	90
6	26	130
7	25	125

- Which grade collected the most cans?
- What was the mean number of cans collected for each student in each grade?
- Which grade should win a prize for most cans collected? Explain your choice.

### Extend

- A set of five distinct natural numbers has a mean of 6 and a median of 6. What is the largest possible number in the set?
- The mean of four natural numbers is 28. If there is only one mode, what is a possible set of numbers?

13. A set of three whole numbers has a median of 17. If the smallest number is 10 and the mean is 15, what is the largest number?

14. A set of four whole numbers has a mode of 7. The smallest number is 2. What is the mean if the largest number is 8?

15. On a recent class test, the mean score was 80%, the mode score was 70%, and the median score was 90%. Kyle scored 80%. Which measure of central tendency would you use to make Kyle feel

- confident about himself? Why?
- like he could do better? Why?

16. Work with a partner to create a scenario where there are two groups that take opposite positions (labour and management, children and parents, etc.).

- Provide data that supports using the mode as the best measure of central tendency.
- Provide data that supports using the median as the best measure of central tendency.

### MATH LINK

A set of seven judges gave the following scores to Susan's diving performance:

7.2, 6.8, 7.3, 8.0, 8.5, 8.2, 6.8

- What is the mean? Round your answer to the nearest tenth.
- What is the median?
- What is the mode?
- Which measure(s) of central tendency best represent the centre of the data? Explain why.

