Compare Data Sets

Getting the Idea

You can compare the means, medians, modes, ranges, and interquartile ranges of two different data sets to draw conclusions about the data.

Example 1

Students at two middle schools sold reusable bags to raise money for Earth Day. Nellie surveyed a sample of ten students from each school to find out how many bags each student sold. Her data is shown in the stem-and-leaf plots.

Roosevelt Middle School

Stem	Leaves
1	0 3 7 9
2	0 1 4 4
3	5
4	2

Key: 1 | 0 = 10 bags

Madison Middle School

Stem	Leaves
1	2 4
2	1 3 6 8 9
3	0 0 4
4	

Key: 1 | 2 = 12 bags

Compare the measures of central tendency for the two schools.

What conclusions can you draw from the comparisons?

Strategy   **Find the mean, median, and mode of each data set. Then compare.**

Step 1   Find the mean number of bags for Roosevelt Middle School.

The numbers of bags that students sold are listed below.

10, 13, 17, 19, 20, 21, 24, 24, 35, 42

$$\text{mean} = \frac{10 + 13 + 17 + 19 + 20 + 21 + 24 + 24 + 35 + 42}{10} = \frac{225}{10} = 22.5$$

Step 2 Find the median number of bags for Roosevelt Middle School.

The median is the middle number.

There are 10 values, so the median is the mean of the two middle values.

Find the mean of the fifth and sixth entries in the stem-and-leaf plot.

$$\text{median} = \frac{20 + 21}{2} = \frac{41}{2} = 20.5$$

Step 3 Find the mode number of bags for Roosevelt Middle School.

The mode is the value that occurs most often.

The mode is 24.

Step 4 Find the mean number of bags for Madison Middle School.

The numbers of bags that students sold are listed below.

12, 14, 21, 23, 26, 28, 29, 30, 30, 34

$$\text{mean} = \frac{12 + 14 + 21 + 23 + 26 + 28 + 29 + 30 + 30 + 34}{10} = \frac{247}{10} = 24.7$$

Step 5 Find the median number of bags for Madison Middle School.

Find the mean of the fifth and sixth entries in the stem-and-leaf plot.

$$\text{median} = \frac{26 + 28}{2} = \frac{54}{2} = 27$$

Step 6 Find the mode number of bags for Madison Middle School.

The mode is 30.

Step 7 Compare the measures of central tendency.

Compare the means: $24.7 - 22.5 = 2.2$

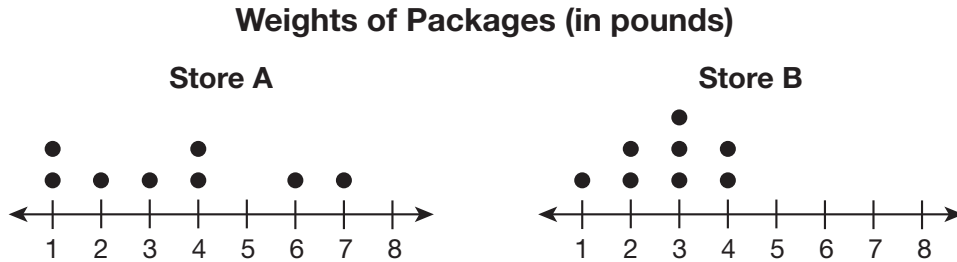Compare the medians: $27 - 20.5 = 6.5$

Compare the modes: $30 - 24 = 6$

Solution **Students at Madison Middle School sold an average of about 2 to 6 more bags than the students at Roosevelt Middle School.**

Example 2

The dot plots show the weights of 8 packages that are waiting to be shipped from two stores owned by a large shipping company.

Weights of Packages (in pounds)

Compare the measures of central tendency for the two stores. What conclusions can you draw from the comparisons? What conclusions can you draw from the dot plots?

Strategy **Find the mean, median, and mode of each data set. Then compare.**

Step 1   Find the mean, median, and mode for Store A.

The weights of the packages at Store A are 1, 1, 2, 3, 4, 4, 6, and 7.

$$\text{mean} = \frac{1 + 1 + 2 + 3 + 4 + 4 + 6 + 7}{8} = \frac{28}{8} = 3.5$$

$$\text{median} = \frac{3 + 4}{2} = \frac{7}{2} = 3.5$$

$$\text{modes} = 1 \text{ and } 4$$

Step 2   Find the mean, median and mode for Store B.

The weights of the packages at Store B are 1, 2, 2, 3, 3, 3, 4, 4.

$$\text{mean} = \frac{1 + 2 + 2 + 3 + 3 + 3 + 4 + 4}{8} = \frac{22}{8} = 2.75$$

$$\text{median} = \frac{3 + 3}{2} = \frac{6}{2} = 3$$

$$\text{mode} = 3$$

Step 3   Compare the measures of central tendency.

Compare the means: $3.5 - 2.75 = 0.75$

Compare the medians: $3.5 - 3 = 0.5$

Compare the modes: You cannot compare the modes since one set of data has 1 mode and the other set has 2 modes.

The mean and median weights of the packages are 0.5 to 0.75 pound heavier at Store A than at Store B.
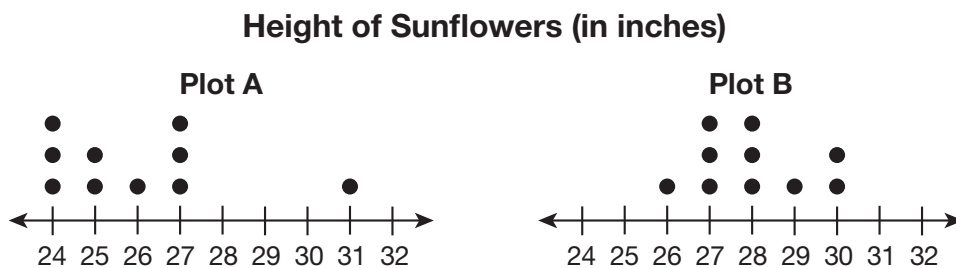
Step 4   Compare the dot plots.

From the dot plots, you can see that the weights of the packages at Store A are more spread out than at Store B. At Store B, the package weights are more closely clustered together.

Solution   **The mean and median weights of the packages are greater at Store A than at Store B. There is a greater variability in the weights of the packages at Store A than at Store B.**

Example 3

The dot plots show the heights of sunflowers grown in two different plots on a farm.

Height of Sunflowers (in inches)

Make a visual comparison of the dot plots. What do they tell you about the average heights of the sunflowers on the two farms?

Compare the mean heights and the mean absolute deviations of the two plots. What conclusions can you draw about the variability of the heights?

Strategy   **Examine and compare the two dot plots. Then, find the mean height and mean absolute deviation for each plot and compare these to your visual findings.**

Step 1   Look at the dot plots and compare them visually.

Notice that the scale on both plots is the same; they both show numbers from 24 to 32.

In Plot A, the dots are all toward the left side of the plot, except for one value. They form a cluster from 24 to 27 inches and have a single outlier of 31 inches.

In Plot B, the dots are all in the middle, with the highest columns of dots on 27 and 28 inches.

In general, the heights appear to be higher in Plot B, and more variable in Plot A.

Step 2   Find the mean for Plot A.

The heights of the sunflowers in Plot A are 24, 24, 24, 25, 25, 26, 27, 27, 27, 31.

$$\text{mean} = \frac{24 + 24 + 24 + 25 + 25 + 26 + 27 + 27 + 27 + 31}{10} = \frac{260}{10} = 26$$

Step 3   Find the mean absolute deviation for Plot A.

Subtract to find the deviations.

$24 - 26 = -2$ $24 - 26 = -2$ $24 - 26 = -2$

$25 - 26 = -1$ $25 - 26 = -1$ $26 - 26 = 0$

$27 - 26 = 1$ $27 - 26 = 1$ $27 - 26 = 1$ $31 - 26 = 5$

Add the absolute deviations: $2 + 2 + 2 + 1 + 1 + 0 + 1 + 1 + 1 + 5 = 16$

Find the mean absolute deviation.

$$\text{mean absolute deviation} = \frac{16}{10} = 1.6$$

Step 4   Find the mean for Plot B.

The heights of the sunflowers in Plot B are: 26, 27, 27, 27, 28, 28, 28, 29, 30, 30.

$$\text{mean} = \frac{26 + 27 + 27 + 27 + 28 + 28 + 28 + 29 + 30 + 30}{10} = \frac{280}{10} = 28$$

Step 5   Find the mean absolute deviation for Plot B.

Subtract to find the deviations.

$26 - 28 = -2$ $27 - 28 = -1$ $27 - 28 = -1$ $27 - 28 = -1$

$28 - 28 = 0$ $28 - 28 = 0$ $28 - 28 = 0$

$29 - 28 = 1$ $30 - 28 = 2$ $30 - 28 = 2$

Add the absolute deviations: $2 + 1 + 1 + 1 + 0 + 0 + 0 + 1 + 2 + 2 = 10$

Find the mean absolute deviation.

$$\text{mean absolute deviation} = \frac{10}{10} = 1$$

Step 6   Compare the means and mean absolute deviations to your visual findings for the dot plots.

The mean height of the sunflowers in Plot B is greater than the mean height of the sunflowers in Plot A. The deviation from the mean is greater in Plot A than in Plot B. These results support the conclusions that you drew in Step 1 from a visual comparison of the two dot plots.
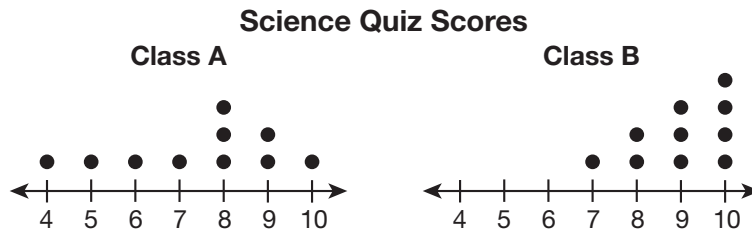
Solution   **The mean height of the sunflowers in Plot B is greater than the mean height of the sunflowers in Plot A. There is a greater variability in the heights in Plot A than in Plot B.**

Coached Example

The dot plots show the grades of students who took the same ten-question science quiz in two different classes.

Science Quiz Scores

Class A

4 5 6 7 8 9 10

Class B

4 5 6 7 8 9 10

Compare the measures of central tendency for each class. What conclusions can you draw from the comparisons?

What are the measures of central tendency? _____

What are the quiz scores for Class A? _____

What is the mean for Class A? _____

What is the median for Class A? _____

What is the mode for Class A? _____

What are the quiz scores for Class B? _____

What is the mean for Class B? _____

What is the median for Class B? _____

What is the mode for Class B? _____

Subtract to compare the means. _____

The mean score of Class A is about _____ than the mean score of Class B.

Subtract to compare the medians. _____

The median score of Class A is about _____ than the median score of Class B.

Subtract to compare the modes. _____

The mode score of Class A is about _____ than the mode score of Class B.

Look at the dot plots.

How does the variability of the scores from Class A compare to the variability of the scores from Class B? _____

The mean, median, and mode scores of Class A are _____ than those of Class B.

The variability of the scores from Class A _____ the variability of the scores from Class B.

Choose the correct answer.

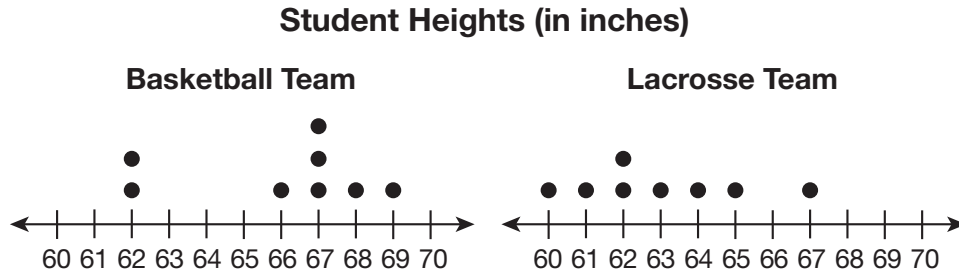**Use the stem-and-leaf plots for questions 1–3.**

The stem-and-leaf plots show the number of students who worked in the computer lab during the months of September and October.

September			October		
Stem	**Leaves**		**Stem**	**Leaves**	
1	0 3 6 7 8		1	1 4 5 5 7 8 8 9	
2	1 2 3 4 4 7		2	0 0 0 2 5 6	
3	2 2 2 9		3	1	

Key: 1 | 0 = 10 students   Key: 1 | 1 = 11 students

1. Which statement about the median number of students in the computer lab is true?

   A. The median for September is the same as the median for October.

   B. The median for September is 4 more than the median for October.

   C. The median for September is 3 less than the median for October.

   D. The median for September is 2 more than the median for October.

2. Which statement about the mode number of students in the computer lab is true?

   A. The mode for September is the same as the mode for October.

   B. The mode for September is 4 less than the mode for October.

   C. The mode for September is 8 more than the mode for October.

   D. The mode for September is 12 more than the mode for October.

3. Which statement about the range of the number of students in the computer lab is true?

   A. The range for September is the same as the range for October.

   B. The range for September is 12 more than the range for October.

   C. The range for September is 9 more than the range for October.

   D. The range for September is 2 less than the range for October.

4. The dot plots show the heights of students on the basketball team and the lacrosse team.

Student Heights (in inches)

Basketball Team   **Lacrosse Team**

60 61 62 63 64 65 66 67 68 69 70   60 61 62 63 64 65 66 67 68 69 70

Which statement about the mean heights is true?

A. The mean height on the basketball team is 3 more than the mean height on the lacrosse team.

**B.** The mean height on the basketball team is 5 more than the mean height on the lacrosse team.

C. The mean height on the basketball team is 7 more than the mean height on the lacrosse team.

D. The mean height on the basketball team is the same as the mean height on the lacrosse team.

5. The double box plot below shows the math quiz scores for Ms. Lindsey's first and second period classes.

Quiz Scores

1st period

2nd period

10   20   30   40
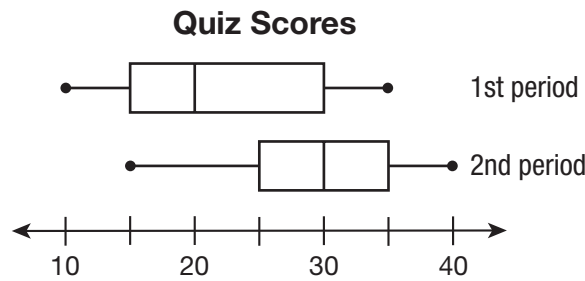
A. Find the median, range, and interquartile range for each class period.

_____

_____

_____

B. What conclusions can you draw from the comparisons? Explain your thinking.

_____

_____

_____

6. The box plot compares the points scored by the winning and losing football teams in a league. Use numbers from the box to make each statement true.

Football Points Scored
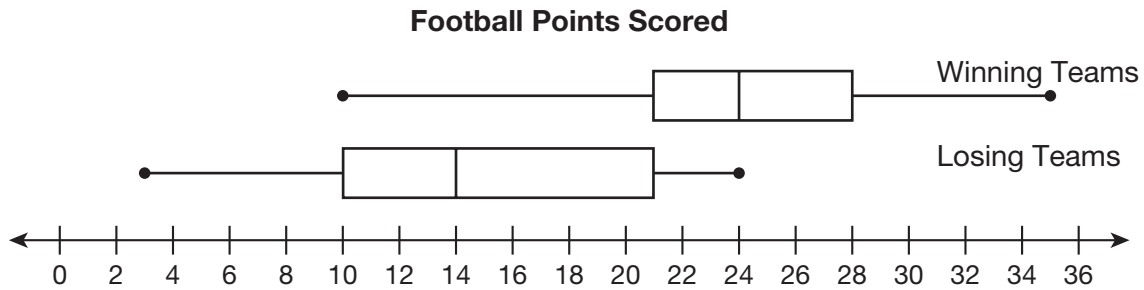
The median for the winning teams was _____.

The median for the losing teams was _____.

The range for the winning teams was _____.

The range for the losing teams was _____.

The interquartile range for the winning teams was _____.

The interquartile range for the losing teams was _____.

3	14	25
7	21	28
11	24	35

7. Richard surveyed a sample of waitresses from two restaurants to find out how much money they make in tips on a weekday evening. The results are shown in the dot plots below. Which is a true statement? Circle all that apply.

Waitress Tips (in dollars)

Seafood Eats   **Bowmans**
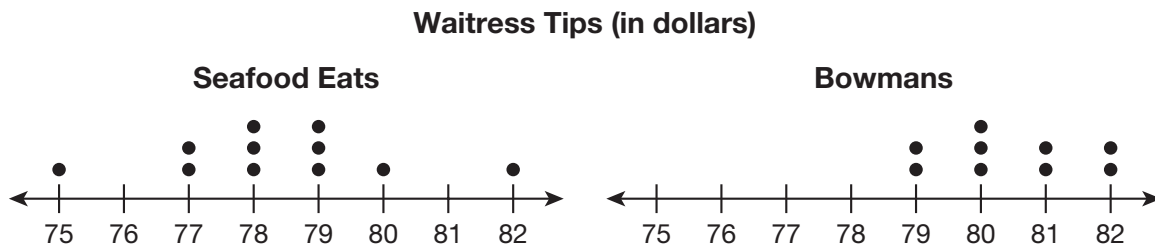
A. On average, the waitresses at Bowmans generally make about $2 more per day in tips than the waitresses at Seafood Eats.

B. The median daily tip total at Bowmans is $2 more than the median daily tip total at Seafood Eats.

C. The mode daily tip total at Seafood Eats is $78 and $79.

D. The range of daily tip totals at Seafood Eats is $4.

E. The range of daily tip totals at Bowmans is $7.

8. The ages of workers at two companies are shown in the stem-and-leaf plots below. Write each number in the correct box.

Endo, Inc.

Stem	Leaves
1	8
2	0 3 3 3 7 9
3	2 6
4	3
5	

Key: 1 | 8 = 18 years old

Blanco, Ltd.

Stem	Leaves
1	
2	2 4 5 8
3	3 5 7 7
4	6
5	2

Key: 2 | 2 = 22 years old

| 23 | 37 | 27.4 | 34 | 30 | 25 |

Mean, Median, Mode of Endo, Inc. Ages	Mean, Median, Mode of Blanco, Ltd. Ages