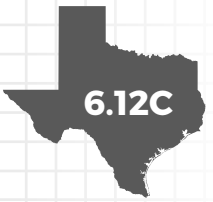
ANALYZING NUMERICAL DATA: SPREAD OF DATA



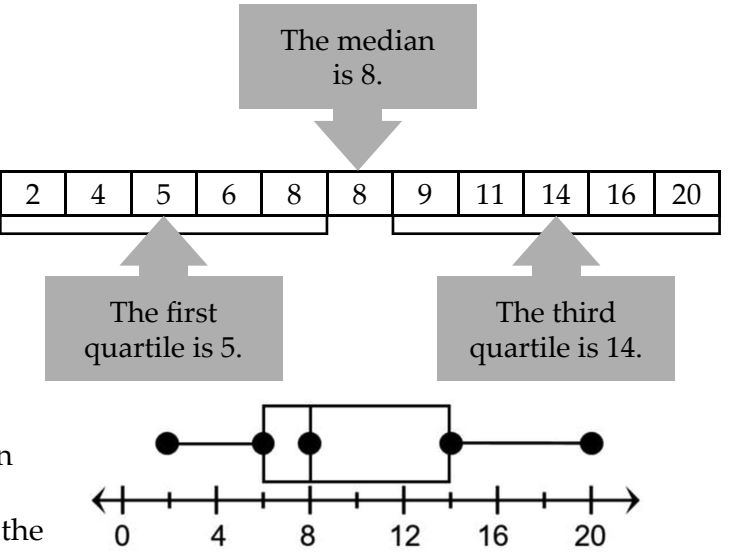
The student is expected to summarize numeric data with numerical summaries, including the mean and median (measures of center) and the range and interquartile range (IQR) (measures of spread), and use these summaries to describe the center, spread, and shape of the data distribution.

TELL ME MORE...

There are two characteristics of a data set that can help you to better understand what the data in the set means: center and spread. The **center** of a data set is a way to describe a typical value in the data set. The **spread** of a data set is how spread out the data values are in the set.

There are two numbers you can use to identify the spread of a data set. Consider the data set shown. There are 11 numbers and the data is listed in order from least to greatest.

- The middle number is the **median**.
- There are five numbers less than the median. This part is called the left half of the data. Its median is the **first quartile**.
- There are five numbers greater than the median. This part is called the right half of the data. Its median is the **third quartile**.

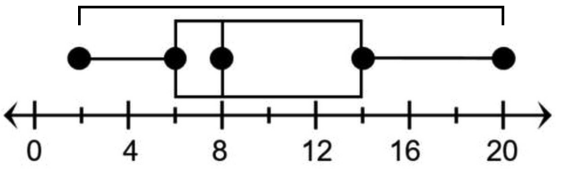


RANGE

The **range** is the difference between the **maximum value** and **minimum value** for a data set.

- For the data set shown, the minimum value is 2 and the maximum value is 20.
- 20 – 2 = 18, so the range is 18.

The range is the distance on a number line between the minimum and maximum values.

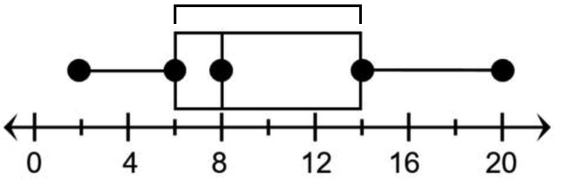


INTERQUARTILE RANGE (IQR)

The **interquartile range** is the difference between the **third quartile** and the **first quartile** for a data set.

- For the data set shown, the first quartile is 6 and the third quartile is 14.
- 14 – 6 = 8, so the interquartile range is 8.
- In a box plot, the interquartile range the width of the box.

The interquartile range is the distance on a number line between the first and third quartiles.



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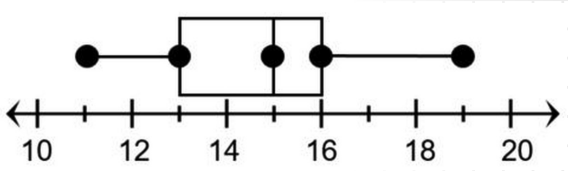
EXAMPLES

EXAMPLE 1: The prices of certain shirts that are for sale at Becky's Shirt Shoppe are shown in the box plot. What are the range and interquartile range of the data?



STEP 1 Determine the range of the data.

- Identify the minimum value.
- The minimum value is the endpoint of the left whisker, which is 11.
- Identify the maximum value.
- The maximum value is the endpoint of the right whisker, which is 19.
- The range is the difference between the maximum value and minimum value: 19 – 11 = 8.

The range of the data is $8.

STEP 2 Determine the interquartile range of the data.

- Identify the first quartile.
- The first quartile is the left side of the box, which is 13.
- Identify the third quartile.
- The third quartile is the right side of the box, which is 16.
- The interquartile range is the difference between the third quartile and first quartile: 16 – 13 = 3.

The interquartile range of the data is $3.

YOU TRY IT!

What are the range and interquartile range (IQR) of this data set?

12, 19, 17, 7, 10, 22, 18

List the values in order from least to greatest.

Identify the minimum value: _____

Identify the maximum value: _____

Range = _____ (maximum) – _____ (minimum) = _____

Identify the first quartile: _____

Identify the third quartile: _____

IQR = _____ (third quartile) – _____ (first quartile) = _____

EXAMPLE 2: The list shows the driving distance to a set of cities from Austin, Texas. Determine the range of the data set. Record your answer and fill in the bubbles. Be sure to use the correct place value.

195, 80, 577, 350, 495, 180

STEP 1 List the distances in order from least to greatest.

80, 180, 195, 350, 495, 577

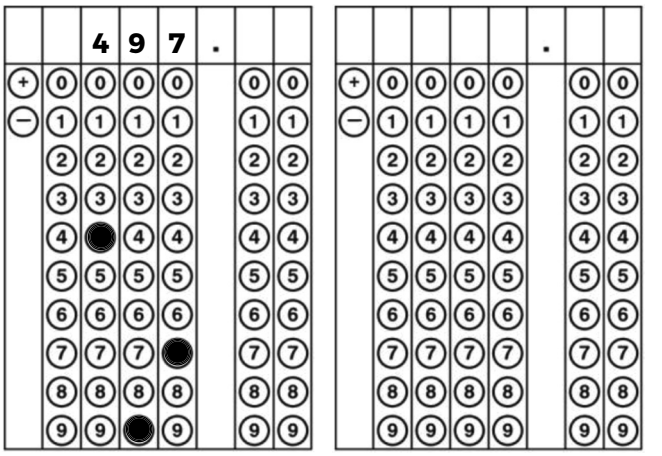
STEP 2 Determine the range.

- The minimum value is 80.
- The maximum value is 577.
- The range is the difference between the minimum and maximum values: 577 – 80 = 497

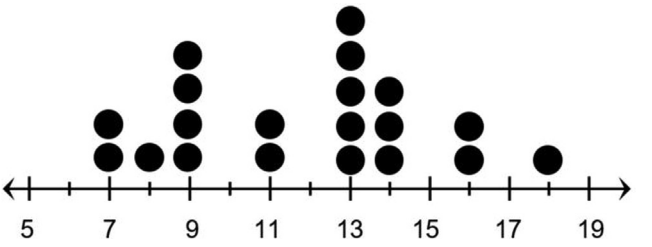
The range is 497 miles.

STEP 3 Since the question is a gridded response question, enter your response on the grid provided. Practice using the grid with the instructions.

1. Record a 4 in the hundreds column. Record a 9 in the tens column. Record a 7 in the ones column. Ignore the sign since the answer is a positive number.
2. Bubble **4** beneath the numeral 4. Bubble **9** beneath the numeral 9. Bubble **7** beneath the numeral 7**.**

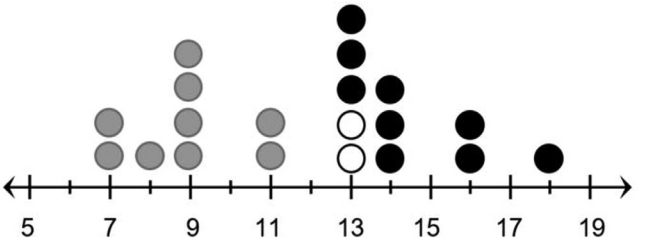


EXAMPLE 3: The dot plot shows the number of laps that students walked for a recent walk-a-thon choir fundraiser. What is the interquartile range of the data set?



STEP 1 Determine the median.

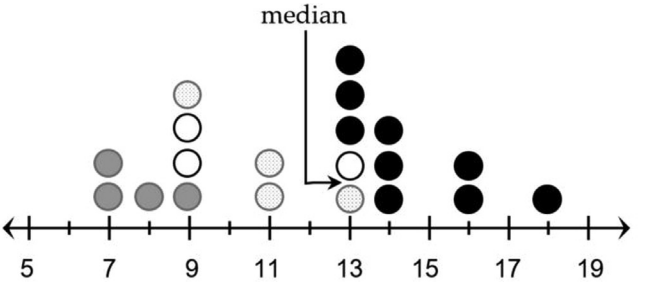
- The median is the middle number in the data set.
- There are 20 numbers in the data set, which is an even number, so data values 10 and 11 are the two middle numbers.
- Count from left to right in the dot plot to determine the 10th and 11th data values.
- Both data values are 13, so the median is 13.



The median is 13 laps.

STEP 2 Determine the first quartile.

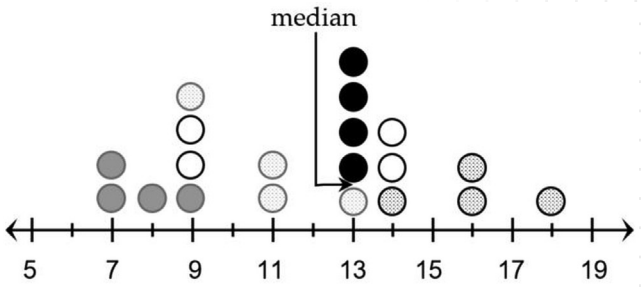
- The first quartile is the middle number of the values that are less than the two middle data values.
- There are 10 values less than the median, so the average of the 5th and 6th data values is the first quartile.
- $(9 + 9) \div 2 = 9$



The first quartile is 9.

STEP 3 Determine the third quartile.

- The third quartile is the middle number of the values that are greater than the two middle data values.
- There are 10 values greater than the median, so the average of the 10th and 11th data values is the first quartile: (14 + 14) ÷ 2 = 14



The third quartile is 14.

STEP 4 Determine the interquartile range.

- The interquartile range is the difference between the third quartile and first quartile.
- 14 – 9 = 5

The interquartile range is 5.

PRACTICE

Use the following information for questions 1-3.

- The ages of the members of the Blake family are 46, 24, 18, 20, 48, and 17.
- The ages of the members of the Tran family are 37, 6, 9, 36, 6, and 11.

1. What is the range of ages for each family?

2. What is the interquartile range (IQR) of each data set?

3. Which set of data has points that are more spread apart compared to the other set?

Use the following information for questions 4-6.

The number of canned goods brought in by each of the homeroom classes is shown in the list.

112, 256, 185, 314, 363, 227

4. What is the range of the data set?

5. What is the interquartile range (IQR) of the data set?

6. What does the difference in the IQR from the range indicate about the spread of the data points?

Use the following information for questions 7-8.

The scores for the school basketball team in the last 6 games are listed.

82, 86, 106, 90, 104, 95

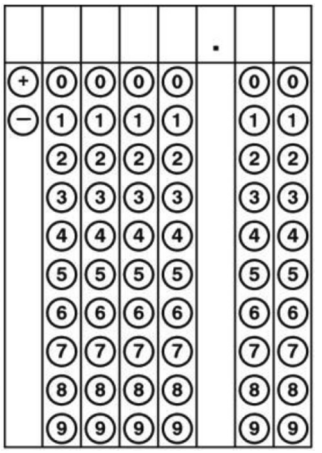
7. What is the range of the data?

8. What is the interquartile range of the data?

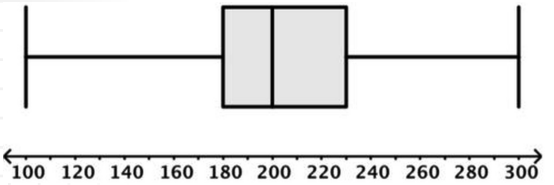
9. The list shows the lengths of objects, in millimeters, measured in science class.

96, 76, 88, 82, 73, 58, 90, 76

What is the range of the lengths in millimeters? Record your answer and fill in the bubbles. Be sure to use correct place value.



10. The box plot represents the bowling scores for The Dragons bowling team.



Which statement most accurately describes the spread of the data?

A The range of scores is 300 points.

B The interquartile range is 50 points.

C The range of scores is 50 points.

D The interquartile range is 200 points.

11. The average daily temperatures in degrees Fahrenheit in a city are listed below for recent months.

49, 52, 53, 56, 58, 61, 62, 64, 61, 55, 48

What is the interquartile range for these temperatures?

F 9°

G 16°

H 56°

J 1°

12. The list represents the life expectancies in years of men in 6 countries.

70.9, 63.5, 73.6, 58.2, 46.8, 75.1

What are the measures of spread for these life expectancies?

A The range is 75.1 and the interquartile range is 67.2.

B The range is 15.4 and the interquartile range is 28.3.

C The range is 9.0 and the interquartile range is 7.9.

D The range is 28.3 and the interquartile range is 15.4.