

11-3 Measures of Variation

For the data set, find the median, the first and third quartiles, and the interquartile range.

2. texts per day: 24, 53, 38, 12, 31, 19, 26

SOLUTION:

Order the numbers from least to greatest.

12, 19, 24, 26, 31, 38, 53

The middle value is 26. The first quartile is 19. The third quartile is 38.

The difference between the first and third quartile is 19.

ANSWER:

median: 26; Q_1 : 19; Q_3 : 38; IQR: 19

4. The table shows the number of minutes of exercise for each person. Compare and contrast the measures of variation for both weeks.

Minutes of Exercise		
	Week 1	Week 2
Tanika	45	30
Tasha	40	55
Tyrone	45	35
Uniqua	55	60
Videl	60	45
Wesley	90	75

SOLUTION:

The range for Week 1 is $90 - 40$ or 50. The range for Week 2 is $75 - 30$ or 45.

Order the numbers for the first week from least to greatest: 40, 45, 45, 55, 60, 90

Order the numbers for the second week from least to greatest: 30, 35, 45, 55, 60, 75

The median of the first week is $\frac{45+55}{2}$ or 50.

The median of the second week is $\frac{45+55}{2}$ or 50.

The first quartile of the first week is 45. The first quartile of the second week is 35.

The third quartile of the first week is 60. The third quartile of the second week is 60.

Sample answer: Both sets of data have the same median number of minutes while the middle data in the first set are grouped more closely than the middle data in the second.

ANSWER:

ranges: 50 and 45; medians: both 50; Q_1 : 45 and 35; Q_3 : both 60; IQR: 15 and 25; Sample answer: Both sets of data have the same median number of minutes while the middle data in the first set are grouped more closely than the middle data in the second.

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6. **Use Math Tools** The *double stem-and-leaf plot*, where the stem is in the middle and the leaves are on either side, shows the high temperatures for two cities in the same week. Use the measures of variation to describe the data in the stem-and-leaf plot.

Minneapolis		Columbus
5 3 1 0	2	5 7 9 9
6 4	3	7
3	4	8
	5	
	6	2
613 = 36°		215 = 25°

SOLUTION:

Minneapolis

Order the numbers from least to greatest: 20, 21, 23, 25, 34, 36, 43

The range is $43 - 20$ or 23.

The median is 25, the first quartile is 21, and the third quartile is 36.

The interquartile range is $36 - 21$ or 15.

Columbus

Order the numbers from least to greatest: 25, 27, 29, 29, 37, 48, 62

The range is $62 - 25$ or 37.

The median is 29, the first quartile is 27, and the third quartile is 48.

The interquartile range is $48 - 27$ or 21.

Sample answer: The Minneapolis temperatures are closer together than the Columbus temperatures.

ANSWER:

Minneapolis—range: 23; degrees; Q_3 : 36 degrees; Q_1 : 21 degrees; IQR: 15 degrees; Columbus—range: 37 degrees; Q_3 : 48 degrees; Q_1 : 27 degrees; IQR: 21 degrees; Sample answer: The Minneapolis temperatures are closer together than the Columbus temperatures.

8. **Reason Abstractly** Create a list of data with at least six numbers that has an interquartile range of 15 and two outliers.

SOLUTION:

Sample answer: 6, 30, 33, 41, 45, 71

The first quartile is 30, the third quartile is 45. The interquartile is $45 - 30$ or 15.

The two outliers are 6 and 71.

ANSWER:

Sample answer: 6, 30, 33, 41, 45, 71

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10. **Reason Inductively** Explain why the median is not affected by very high or very low values in the data.

SOLUTION:

Sample answer: The median is the middle number of a data set. Very high values and very low values typically fall at the beginning or end of a data set. Therefore, the median is not affected by these values.

ANSWER:

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12. The table shows the countries with the most Internet users.

Millions of Internet Users	
China	99.8
Germany	41.88
India	36.97
Japan	78.05
South Korea	31.67
United Kingdom	33.11
United States	185.55

- Find the range of the data.
- Find the median and the first and third quartiles.
- Find the interquartile range.
- Name any outliers in the data.

SOLUTION:

a. The range is $185,550,000 - 31,670,000$ or $153,880,000$.

b. Order the numbers from least to greatest.

31.67, 33.11, 36.97, 41.88, 78.05, 99.8, 185.55

The median is 41,880,000. The first quartile is 33,110,000 and the third quartile is 99,800,000.

c. The interquartile range is $99,800,000 - 33,110,000$ or $66,690,000$.

d. There are no outliers.

ANSWER:

a. 153,880,000

b. 41,880,000; 33,110,000; 99,800,000

c. 66,690,000

d. none

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14. Find the median, the first and third quartiles, and the interquartile range for the cost of admission: \$13.95, \$24.59, \$19.99, \$29.98, \$23.95, \$28.99.

SOLUTION:

Order the numbers from least to greatest.

\$13.95, \$19.99, \$23.95, \$24.59, \$28.99, \$29.98

The median is $\frac{23.95 + 24.59}{2}$ or \$24.27. The first quartile is \$19.99 and the third quartile is \$28.99. The interquartile range is $28.99 - 19.99$ or \$9.00.

ANSWER:

median: \$24.27; Q_1 : \$19.99; Q_3 : \$28.99; IQR: \$9.00

16. The data shows the number of dogs enrolled in different obedience classes.

Number of Dogs in Obedience Classes				
8	12	20	10	6
15	12	9	10	22

- Order the values from least to greatest.
- Find the range of the data.
- Find the median and the first and third quartiles.
- Find the interquartile range.

SOLUTION:

Order the numbers from least to greatest: 6, 8, 9, 10, 10, 12, 12, 15, 20, 22

The range is $22 - 6$ or 16.

The median is 11.

The first quartile is 9. The third quartile is 15.

The interquartile range is $15 - 9$ or 6.

ANSWER:

- 6, 8, 9, 10, 10, 12, 12, 15, 20, 22
- 16
- 11, 9, 15
- 6

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Divide.

$$18.188 \div 8$$

SOLUTION:

$$\begin{array}{r} 23.5 \\ 8 \overline{)188.0} \\ \underline{-16} \\ 28 \\ \underline{-24} \\ 40 \\ \underline{-40} \\ 0 \end{array}$$

ANSWER:

$$23.5$$

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20. $87.5 \div 5$

SOLUTION:

$$\begin{array}{r} 17.5 \\ 5 \overline{)87.5} \\ \underline{-5} \\ 37 \\ \underline{-35} \\ 25 \\ \underline{-25} \\ 0 \end{array}$$

ANSWER:

17.5

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22. $74.4 \div 6$

SOLUTION:

$$\begin{array}{r} 12.4 \\ 6 \overline{)74.4} \\ \underline{-6} \\ 14 \\ \underline{-12} \\ 24 \\ \underline{-24} \\ 0 \end{array}$$

ANSWER:

12.4

24. Refer to the table. How many more hours did Koli work in week 2 than in week 3?

Week	Hours Worked
1	12
2	16
3	9

SOLUTION:

Koli worked $16 - 9$ or 7 more hours in week 2 than in week 3.

ANSWER:

7 hours