

UNIT 4 • DESCRIBING DATA

Lesson 1: Working with a Single Measurement Variable

Instruction

Guided Practice 4.1.3

Example 1

Two hockey teams recorded the number of goals scored each game in the tables below. Use the tables to compare the expected number of goals scored per game for the two teams using both measures of center and spread.

Team 1: Ice Kings	
Game	Number of goals scored
1	0
2	0
3	0
4	2
5	1
6	2
7	2
8	1
9	2
10	6
11	5
12	2
13	5
14	2

Team 2: Gliders	
Game	Number of goals scored
1	3
2	6
3	0
4	6
5	0
6	1
7	1
8	2
9	0
10	3
11	3
12	2
13	4
14	2

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1. Determine which measure of center to use. Order the goals scored for each team from least to greatest.

Team 1: Ice Kings	
Game	Number of goals scored
1	0
2	0
3	0
5	1
8	1
4	2
6	2
7	2
9	2
12	2
14	2
11	5
13	5
10	6

Team 2: Gliders	
Game	Number of goals scored
3	0
5	0
9	0
6	1
7	1
8	2
12	2
14	2
1	3
10	3
11	3
13	4
2	6
4	6

2. Look at the range of values. Determine if there are any data values in either table that are much larger or much smaller than the rest of the data set. If there are, use the median. If there are not, use either the mean or the median.

The largest and smallest data values in each data set are not much smaller or much larger than the rest of the data. There aren't any values in the tables that will greatly influence the mean, so either the median or mean would be valid measures of center.

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3. Calculate the chosen measure of center.

Since it was determined that either measure of center was acceptable, select one. Let's use the mean. To calculate the mean, find the sum of goals scored for each team, and then divide the total goals by the number of games played.

Ice Kings:

$$\frac{0+0+0+1+1+2+2+2+2+2+2+2+5+5+6}{14} \approx 2.14$$

Gliders:

$$\frac{0+0+0+1+1+2+2+2+3+3+3+4+6+6}{14} \approx 2.36$$

4. Compare the measures of center for the two teams.

The two teams have performed similarly over the 14 games. In any given game, you could expect either team to score at least 2 goals.

5. Calculate a measure of spread.

Since we chose to calculate the mean, now we will use the mean absolute deviation to compare the goals per team. Mean absolute deviation compares the range of values to the mean value. To calculate the mean absolute deviation, first find the absolute value of the difference between each data point and the mean:

$$|\text{data point} - \text{mean}|$$

The mean for the Ice Kings is 2.14. The mean for the Gliders is 2.36.

(continued)

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Team 1: Ice Kings		
Game	Number of goals scored	Absolute difference
1	0	$ 0 - 2.14 = 2.14$
2	0	$ 0 - 2.14 = 2.14$
3	0	$ 0 - 2.14 = 2.14$
5	1	$ 1 - 2.14 = 1.14$
8	1	$ 1 - 2.14 = 1.14$
4	2	$ 2 - 2.14 = 0.14$
6	2	$ 2 - 2.14 = 0.14$
7	2	$ 2 - 2.14 = 0.14$
9	2	$ 2 - 2.14 = 0.14$
12	2	$ 2 - 2.14 = 0.14$
14	2	$ 2 - 2.14 = 0.14$
11	5	$ 5 - 2.14 = 2.86$
13	5	$ 5 - 2.14 = 2.86$
10	6	$ 6 - 2.14 = 3.86$

Next, sum the absolute differences.

$$2.14 + 2.14 + 2.14 + 1.14 + 1.14 + 0.14 + 0.14 + 0.14 + 0.14 + 0.14 + 0.14 + 2.86 + 2.86 + 3.86 = 19.12$$

Lastly, divide the sum of the absolute differences by the number of data points (14).

$$\frac{19.12}{14} \approx 1.37$$

The mean absolute deviation for the Ice Kings is 1.37.

(continued)

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Team 2: Gliders		
Game	Number of goals scored	Absolute difference
3	0	$ 0 - 2.36 = 2.36$
5	0	$ 0 - 2.36 = 2.36$
9	0	$ 0 - 2.36 = 2.36$
6	1	$ 1 - 2.36 = 1.36$
7	1	$ 1 - 2.36 = 1.36$
8	2	$ 2 - 2.36 = 0.36$
12	2	$ 2 - 2.36 = 0.36$
14	2	$ 2 - 2.36 = 0.36$
1	3	$ 3 - 2.36 = 0.64$
10	3	$ 3 - 2.36 = 0.64$
11	3	$ 3 - 2.36 = 0.64$
13	4	$ 4 - 2.36 = 1.64$
2	6	$ 6 - 2.36 = 3.64$
4	6	$ 6 - 2.36 = 3.64$

Next, sum the absolute differences.

$$2.36 + 2.36 + 2.36 + 1.36 + 1.36 + 0.36 + 0.36 + 0.36 + 0.64 + 0.64 + 0.64 + 1.64 + 3.64 + 3.64 = 21.72$$

Lastly, divide the sum of the absolute differences by the number of data points (14).

$$\frac{21.72}{14} \approx 1.55$$

The mean absolute deviation for the Gliders is 1.55.



6. Compare the measures of spread and center for the two teams.

The Ice Kings have a slightly lower mean, but the number of goals scored per game also varies less than the Gliders. The Gliders have a higher mean, but with higher variation.



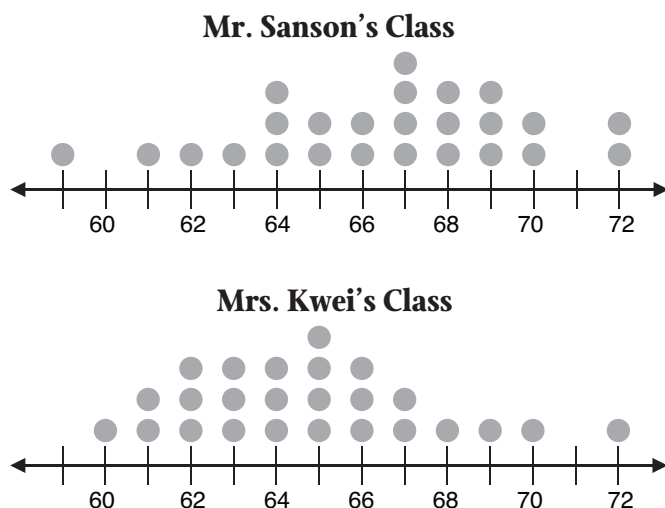
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Example 2

Each girl in Mr. Sanson's class and in Mrs. Kwei's class measured her own height. The heights were plotted on the dot plots below. Use the dot plots to compare the heights of the girls in the two classes.



1. Compare the range of recorded values.

The overall range of heights of girls in the two classes is similar. The heights in the two classes range from 59 inches to 72 inches, and 60 inches to 72 inches.

2. Compare the middle values of the data sets.

The girls in Mr. Sanson's class appear to be taller than the girls in Mrs. Kwei's class. By looking at where the dots are clustered, we can estimate that the middle height in Mr. Sanson's class is around 67 inches. The middle height in Mrs. Kwei's class is 65 inches.

3. Compare the variation in the data sets.

The variation in the two sets of heights appears to be similar, except Mr. Sanson's data is skewed to the left and Mrs. Kwei's data is skewed to the right. The majority of the heights are within approximately 6 inches in both classes. The majority of the girls in Mr. Sanson's class are between 64 and 70 inches, and the majority of the girls in Mrs. Kwei's class are between 61 and 67 inches.

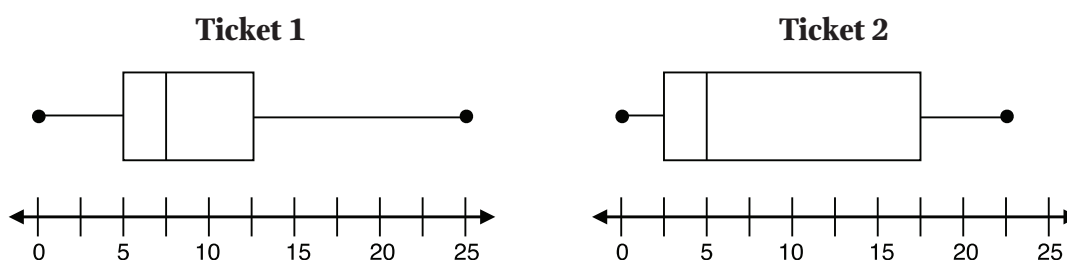
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Example 3

Sam wants to buy a lottery ticket. There are two different tickets that he can buy, and each costs \$10. He found a website with information about how much money others have won with their lottery tickets. The information is presented in two box plots, shown below. Use the two box plots to compare the amounts others have won with Ticket 1 and with Ticket 2.



1. Compare the range of data.

The range of amounts won is similar. With Ticket 1, winnings ranged from \$0 to \$25, and with Ticket 2, winnings ranged from \$0 to \$22.50.

2. Compare the center of the data sets.

The median of the data sets is shown by the vertical line inside the box. The median winnings from Ticket 1 are higher than the median winnings from Ticket 2.

3. Compare the variation of the data.

The interquartile range, or middle 50% of each data set, is contained within the box in each box plot. The IQR of winnings with Ticket 1 is smaller than the IQR of winnings with Ticket 2. Also, consider where the median is in the interquartile range. The median winnings with Ticket 1 are slightly to the left in the interquartile range, indicating that half of the winnings were less than \$7.50 and half were greater. The median winnings with Ticket 2 are to the left in the interquartile range, indicating that half the winnings were less than \$5 and half were more. Given the wide range of winnings with Ticket 2, but the lower median, it is more likely that Sam will win a greater amount with Ticket 1.

