

Stem-and-Leaf & Box-and-Whisker Plots

Anchors Addressed

M11.E.1.1.1 – Create and/or use appropriate graphical representations of data, including box-and-whisker plots, stem-and-leaf plots or scatter plots.

M11.E.1.1.2 – Analyze data and/or answer questions based on displayed data (box-and-whisker plots, stem-and-leaf plots or scatter plots).

M11.E.2.1.2 – Calculate and/or interpret the range, quartiles, and interquartile range of data.



There are several ways in which data can be displayed. Two common methods include the Stem-and-Leaf and Box-and-Whisker Plots.

Stem-and-Leaf Plots

A stem-and-leaf plot is a method of organizing all of the values in a data set. This type of graph does not require computer software, making it quick and accurate. The digits of the greatest place value are listed in the stem. The remaining digits are placed next to the appropriate stem to form the leaves. Each leaf is separated by a space.

Example 1: The stem-and-leaf plot below represents the grades of students in the Algebra I. Answer the following questions about the data.

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

1. What is the highest grade in the class?
2. How many scores were above 75%?
3. What are the measures of central tendency?
4. What is the range of the data?

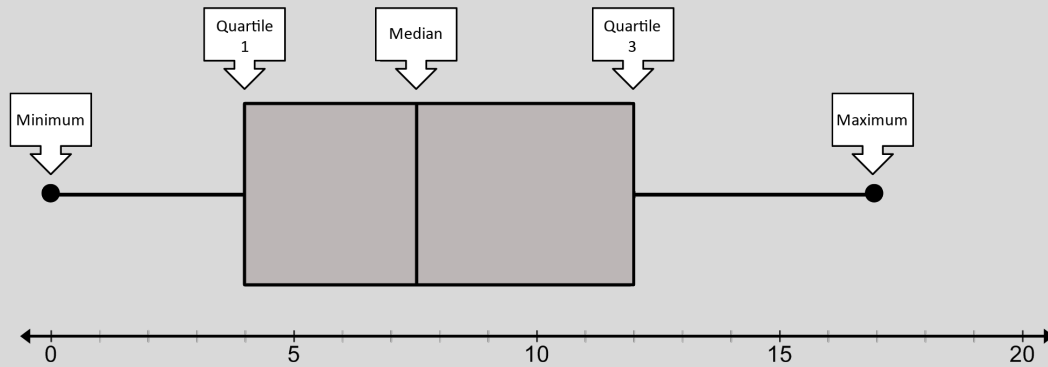
Key: 7 | 5 = 75

Solution: (1) The highest score in the class is 99. (2) Sixteen students scored above a 75%. (3) To find the measures of central tendency begin by writing the numbers in order from greatest to least: 99, 97, 97, ..., 44, 42, 41. Calculate then calculate the mean, median, and mode as usual. Mean: 72, Median: 76.5, Mode: 67, 75, 88, 94, 97. (4) The range is the difference between the highest and lowest value. $99 - 41 = 58$.

Box-and-Whisker Plots

The box-and-whisker plot is drawn above a number line and displays the statistical analysis of the data (e.g. range, quartiles, and median). It does not, however, include the data points. In the graph, the box represents the upper and lower quartiles and the line in the middle of the box represents the median. The whiskers represent the minimum and maximum values.

Example 1: The box-and-whisker plot below represents the number of points on white-tailed deer's antlers at Ohiopyle State Park. Pennsylvania randomly tracks the bucks and records the number of points.



Find the minimum, maximum, range, median, first quartile, third quartile, and interquartile range.

Solution: Use the number line to determine the value of each part of the graph. The minimum value is 0, the maximum value is 17, and therefore the range is $17 - 0 = 17$. The median is represented by the line in the middle of the box, which is 7.5. The first quartile is represented by the left edge of the box and the third quartile is represented by the right edge of the box. Therefore, the first quartile is 4 and the third quartile is 12. Subtracting the quartiles provides the interquartile range: $12 - 4 = 8$.

Exercises

A. Create a stem-and-leaf plot that represents the following data. Then find the mean, median, mode, and the interquartile range. Include a key.

1.

14	17	23	13	12	14	17	25	27
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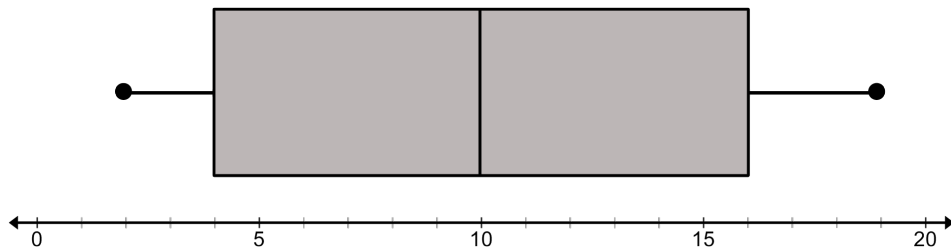
B. Use the following plots to find the mean, median, mode, first quartile, third quartile, and interquartile range. Show your work.

2. The stem-and-leaf plot below represents the SAT scores of a group of students.

Stem	Leaves
14	20 40 40 60 80 80
13	00 00 20 40 40
12	20 40 40 80
11	20 40
10	40 80 80
9	20

Key: 11 | 20 = 1120

3. An onsite computer repair company analyzed the data about the distance traveled for all repairs in 2010. The graph below represents the distances traveled.



4. The stem-and-leaf plot below represents the football scores from a junior football league.

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

Key: 2 | 1 = 21

C. Create a box-and-whisker plot that represents the data contained in the stem-and-leaf plot.

5.

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

Key: 4 | 1 = 41



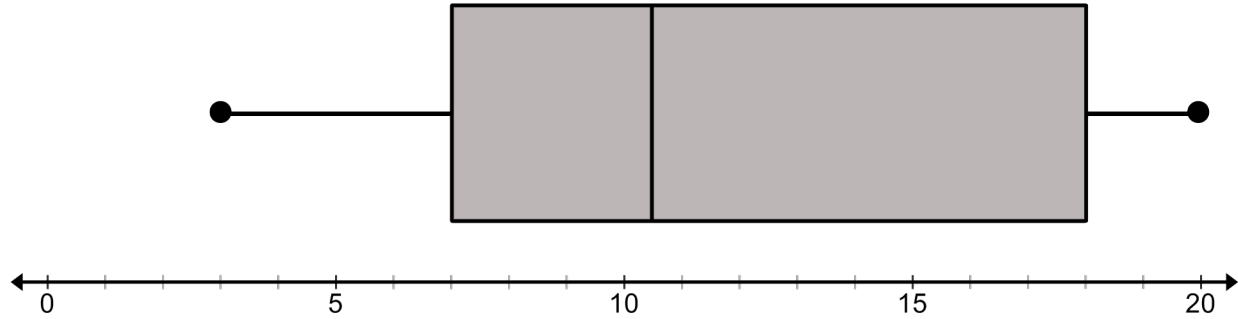
6.

Stem	Leaves
12	3 3 4
10	0 1 4 6 8
9	5 7
8	1 2 4 8
7	0 4 7
6	2 7 8

Key: 9 | 5 = 95



D. Answer the following questions about the box-and-whisker plot below. Show your work.



7. What is the range of the data?

8. What percent of the data does the box represent?

9. What percent of the data does each whisker represent?

10. Complete the table below by placing a check in the box of each statistical measure that can be represented by the these types of graphs.

Measure	Stem-and-Leaf	Box-and-Whisker
Mean	✓	
Median		
Mode		
Quartiles		
Interquartile Range		
Minimum		
Maximum		
Range		

11. Using the table from question 10, which graph provides more statistical information? Why?