

Lesson 13-5

Example 1 Draw a Box-and-Whisker Plot

The following is a list of speeds of 12 of the fastest animals.

Animal	Speed (mph)
Cheetah	70
Pronghorn antelope	61
Wildebeest	50
Lion	50
Thomson's gazelle	50
Quarter horse	47.5
Elk	45
Cape hunting dog	45
Coyote	43
Gray fox	42
Hyena	40
Zebra	40

Source: *The World Almanac*

a. Draw a box-and-whisker plot for these data.

Step 1 Determine the critical points.

The data is already ordered from greatest to least. Use the list to determine the quartiles.

$$\begin{array}{ccccccc}
 40, & 40, & 42, & 43, & 45, & 45, & 47.5, & 50, & 50, & 50, & 61, & 70 \\
 & & & \uparrow & & & \uparrow & & & \uparrow & & \\
 Q_1 = & \frac{43 + 42}{2} & & Q_2 = & \frac{45 + 47.5}{2} & & Q_3 = & \frac{50 + 50}{2} \\
 & = 42.5 & & & = 46.25 & & & = 50
 \end{array}$$

Determine the interquartile range.

$$\text{IQR} = 50 - 42.5 \text{ or } 7.5$$

Check to see if there are any outliers.

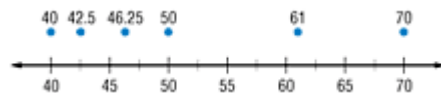
$$42.5 - 1.5(7.5) = 31.25 \quad 50 + 1.5(7.5) = 61.25$$

Any numbers less than 31.25 or greater than 61.25 are outliers.

The only outlier is 70.

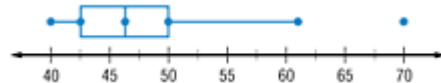
Step 2 Draw a number line.

Assign a scale to the number line that includes the extreme values. Above the number line, place bullets to represent the three quartile points, any outliers, the least number that is *not* an outlier, and the greatest number that is *not* an outlier.



Step 3 Complete the box-and-whisker plot.

Draw a box to designate the data between the upper and lower quartiles. Draw a vertical line through the point representing the median. Draw a line from the lower quartile to the least value that is *not* an outlier. Draw a line from the upper quartile to the greatest value that is *not* an outlier.



b. What does the box-and-whisker plot tell about the data?

The data seems to be even since the box is split in two equal parts. The tail on the upper half is longer than the tail for the lower half, therefore, the lower half of the data is less dispersed than the upper half of the data.

Example 2 Draw Parallel Box-and-Whisker Plots

The following table shows the SAT mean verbal and math scores of college-bound seniors for several western states in 2001.

SAT Mean Verbal and Math Scores		
State	Verbal	Math
Arizona	523	525
California	498	517
Colorado	539	542
Idaho	543	542
Montana	539	539
Nevada	509	515
New Mexico	551	542
Oregon	526	526
Utah	575	570
Washington	527	527
Wyoming	547	545

Source: *The World Almanac*

a. Draw a parallel box-and-whisker plot for the data.

Determine the quartiles and outliers for verbal and math.

Verbal:

498, 509, 523, 526, 527, 539, 539, 543, 547, 551, 575

 ↑ ↑ ↑
 Q_1 Q_2 Q_3

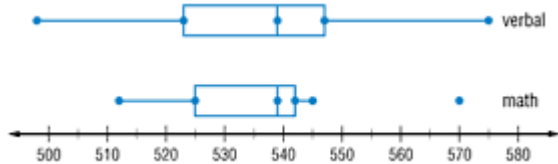
Math:

515, 517, 525, 526, 527, 539, 542, 542, 542, 545, 570

 ↑ ↑ ↑
 Q_1 Q_2 Q_3

The math score of 570 is an outlier since the interquartile range is $542 - 525$ or 17 and $542 + 1.5(17) = 567.5$.

Draw the box-and-whisker plots using the same number line.



b. Use the parallel box-and-whisker plot to compare the data.

The range for the verbal scores is much greater than for the math scores.