

More Practice with Box Plots

Student Objectives

- Given a box plot, I can summarize the data by the 5-number summary (Min, Q1, Median, Q3, Max) and the interquartile range.
- I can construct a box plot from a 5-number summary.

You reach into a jar of Tootsie Pops. How many Tootsie Pops do you think you could hold in one hand? Do you think the number you could hold is greater than or less than what other students can hold? Is the number you could hold a typical number of Tootsie Pops? This lesson examines these questions.

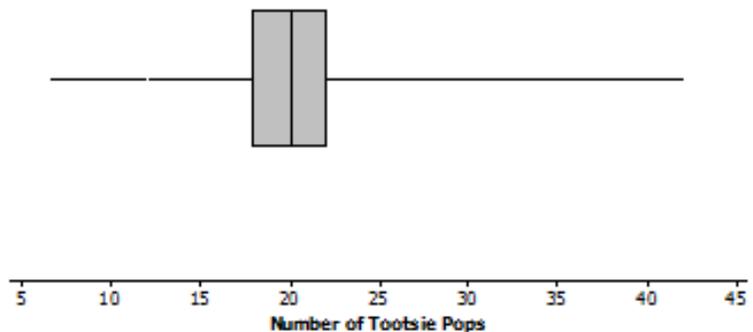
Classwork**Example 1: Tootsie Pops**

As you learned earlier, the five numbers that you need to make a box plot are the minimum, the lower quartile, the median, the upper quartile, and the maximum. These numbers are called the 5-number summary of the data.

Ninety-four people were asked to grab as many Tootsie Pops as they could hold. Here is a box plot for these data. Are you surprised?

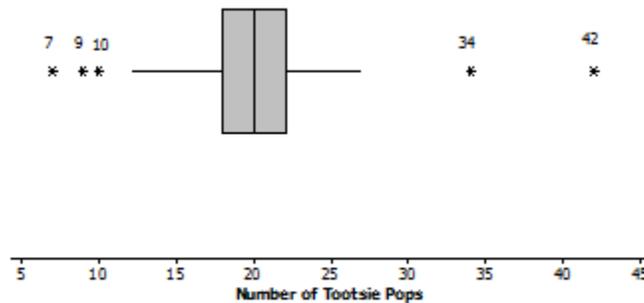
Exercises 1–5

1. What might explain the variability in how many Tootsie Pops those 94 people were able to hold?



2. Estimate the values in the 5-number summary from the box plot.
3. Here is Jayne's description of what she sees in the plot. Do you agree or disagree with her description?
 - * One person could hold as many as 42 Tootsie Pops. _____
 - The number of Tootsie Pops people could hold was really different and spread about equally from 7 to 42. _____
 - About one half of the people could hold more than 20 Tootsie Pops. _____

4. Here is a different plot of the same data on the number of Tootsie Pops 94 people could hold. The 5 values are separated and labeled because they are _____ not typical of the rest of the data or lie outside the common results).



Does knowing these data values change anything about your responses to Exercise 3?

Exercises 5–8: Maximum Speeds

The maximum speeds of selected birds and land animals are given in the tables below.

Bird	Speed (mph)
Peregrine falcon	242
Swift bird	120
Spine-tailed swift	106
White-throated needletail	105
Eurasian hobby	100
Pigeon	100
Frigate bird	95
Spur-winged goose	88
Red-breasted merganser	80
Canvasback duck	72
Anna's Hummingbird	61.06
Ostrich	60

Land animal	Speed (mph)
Cheetah	75
Free-tailed bat (in flight)	60
Pronghorn antelope	55
Lion	50
Wildebeest	50
Kangaroo	45
African wild dog	44
Jackrabbit	44
Horse	44
Thomson's gazelle	43
Greyhound	43
Coyote	40
Mule deer	35
Grizzly bear	30
Cat	30
Elephant	25
Pig	9

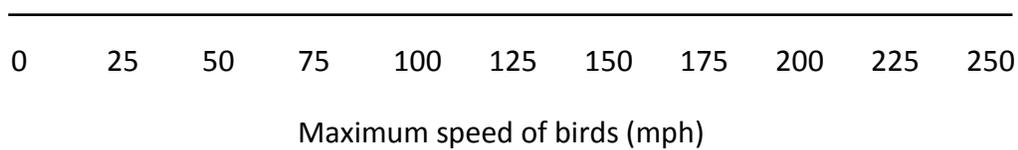
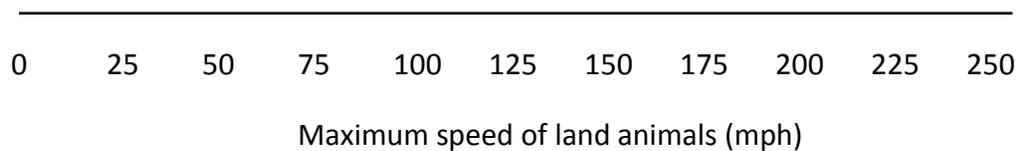
Data Source: Natural History Magazine, March 1974, copyright 1974; The American Museum of Natural History; and James G. Doherty, general curator, The Wildlife Conservation Society;

<http://www.thetravelalmanac.com/lists/animals-speed.htm>; http://en.wikipedia.org/wiki/Fastest_animals

5. Do birds or land animals seem to have the greatest variability in speeds? Explain your reasoning.

6. Find the 5-number summary for the speeds in each data set. What do the 5-number summaries tell you about the distribution of speeds for each data set?

7. Use the 5-number summaries to make a box plot for each of the two data sets.



8. Write several sentences to tell someone about the speeds of birds and land animals.

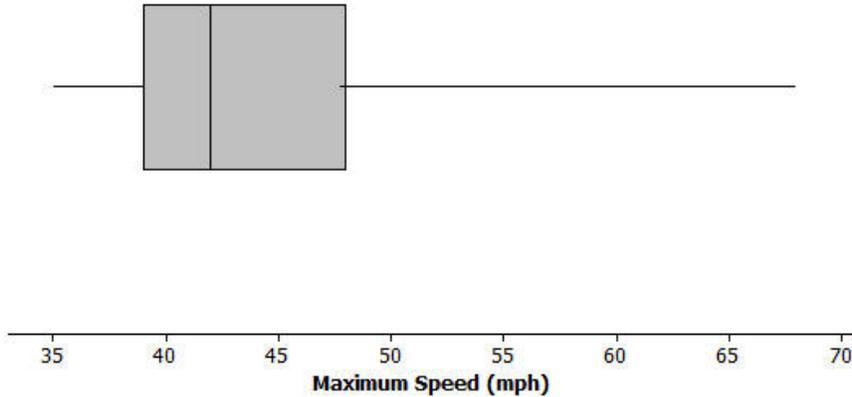
Lesson Summary

In this lesson, you learned about the 5-number summary for a set of data: minimum, lower quartile, median, upper quartile, and maximum. You made box plots after finding the 5-number summary for two sets of data (speeds of birds and land animals), and you estimated the 5-number summary from box plots (number of Tootsie Pops people can hold, class scores). You also found the interquartile range (IQR), which is the difference between the upper quartile and lower quartile. The IQR, the length of the box in the box plot, indicates how closely the middle half of the data is bunched around the median. (Note that because sometimes data values repeat and the same numerical value may fall in two sections of the plot, it is not always exactly half. This happened with the two speeds of 50 mph – one went into the top quarter of the data and the other into the third quarter – the upper quartile was 50.)

You also practiced describing a set of data using the 5-number summary, making sure to be as precise as possible- avoiding words like “a lot” and “most” and instead saying about one half or three fourths.

Homework Homework Homework Homework Homework

1. The box plot below summarizes the maximum speeds of certain kinds of fish.



a. Estimate the 5-number summary from the box plot.

Min = _____, _____, _____, _____, _____

b. The fastest fish is the sailfish at 68 mph followed by the marlin at 50 mph. What does this tell you about the spread of the fish speeds in the top quarter of the plot?

c. Use the 5-number summary and the IQR to **describe** the speeds of the fish. (Hint : $IQR = UQ - LQ$)

2. Suppose you knew that the interquartile range for the number of hours students spent playing video games during the school week was 10. Do you think the following statements are true or false? Explain your reasoning.

a. About half of the students played video games for 10 hours during a school week.

b. All of the students played at least 10 hours of video games during the school week.

c. About half of the class could have played video games from 10 to 20 hours a week or from 15 to 25 hours.

3. The speeds for the fastest dogs are given in the table below.

Breed	Speed (mph)
Greyhound	45
African Wild Dog	44
Saluki	43
Whippet	36
Basanji	35
German Shepherd	32
Vizsla	32
Doberman Pinscher	30
Irish Wolfhound	30
Dalmatian	30
Border Collie	30
Alaskan Husky	28
Giant Schnauzer	28
Jack Russell Terrier	25
Australian Cattle Dog	20

a. Find the 5-number summary for this data set and use it to create a **box plot** of the speeds.

b. Why is the median not in the center of the box?

Data Source: <http://www.vetstreet.com/our-pet-experts/meet-eight-of-the-fastest-dogs-on-the-planet>; <http://canidaepetfood.blogspot.com/2012/08/which-dog-breeds-are-fastest.html>

4. **Solve** the equation. Show your work. **Check** your solution.

$$4p = 150 - 3(42 - p)$$