

## Lesson 15: More Practice with Box Plots

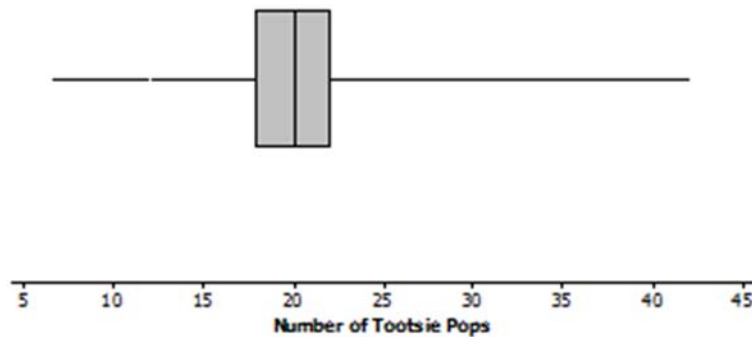
You reach into a jar of Tootsie Pops. How many Tootsie Pops do you think you could hold in one hand? Do you think the number you could hold is greater than or less than what other students can hold? Is the number you could hold a typical number of Tootsie Pops? This lesson examines these questions.

### 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

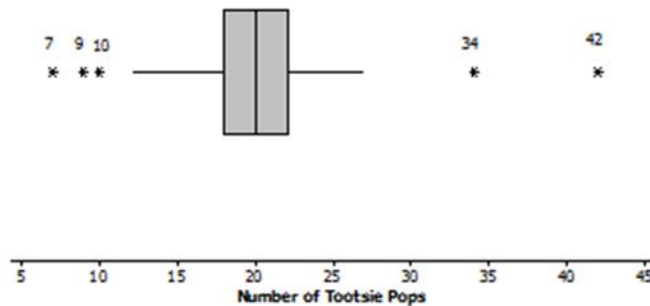
1. What might explain the variability in how many Tootsie Pops those 94 people were able to hold?
2. Estimate the values in the 5-number summary from the box plot.

3. Describe how the box plot can help you understand the difference in the number of Tootsie Pops people could hold.

4. Here is Jayne's description of what she sees in the plot. Do you agree or disagree with her description? Explain your reasoning.

"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."

5. Here is a different plot of the same data on the number of Tootsie Pops 94 people could hold.

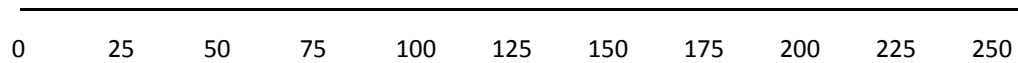


a. Why do you suppose the five values are separate points and are labeled?

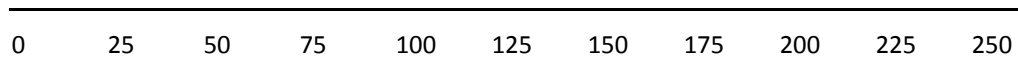
b. Does knowing these data values change anything about your responses to Exercises 1 to 4 above?



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



Maximum speed of land animals (mph)

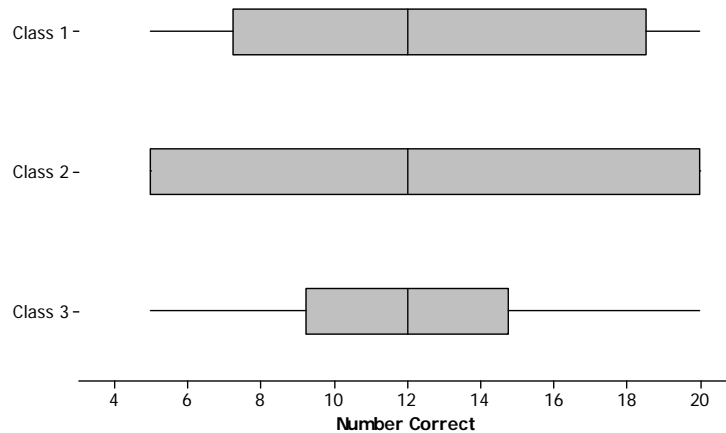


Maximum speed of birds (mph)

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

**Exercises 11–15: What is the Same and What is Different?**

Consider the following box plots, which show the number of questions different students in three different classes got correct on a 20-question quiz.



11. Describe the variability in the scores of the three classes.
12. a. Estimate the interquartile range for each of the three sets of scores.
- b. What fraction of students does the interquartile range represent?
- c. What does the value of the IQR tell you about how the scores are distributed?

13. The teacher asked students to draw a box plot with a minimum value at 34 and a maximum value at 64 that had an interquartile range of 10. Jeremy said he could not draw just one because he did not know where to put the box on the number line. Do you agree with Jeremy? Why or why not?
14. Which class do you believe performed the best? Be sure to use the data from the box plots to back up your answer.
15. a. Find the IQR for the three data sets in the first two examples: maximum speed of birds, maximum speed of land animals, and number of Tootsie Pops.
- b. Which data set had the highest percentage of data values between the lower quartile and the upper quartile? Explain your thinking.

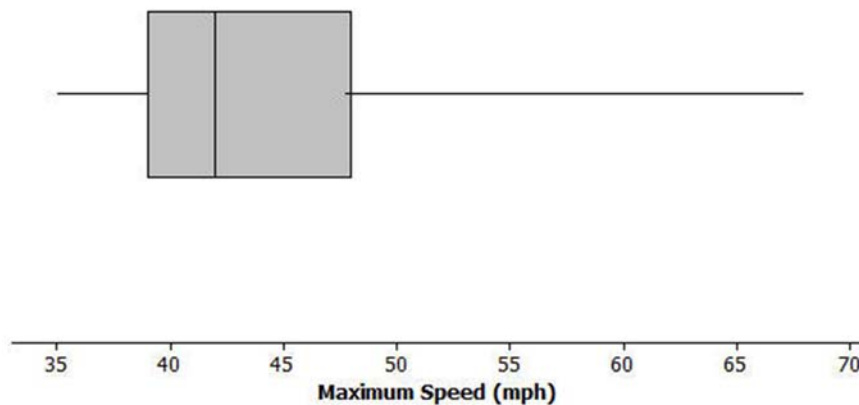
**Lesson Summary**

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.

**Problem Set**

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



- Estimate the 5-number summary from the box plot.
  - 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?
  - Use the 5-number summary and the IQR to describe the speeds of the fish.
2. Suppose you knew that the interquartile range for the number of hours students spent playing video games during the school week was 10. What do you think about each of the following statements? Explain your reasoning.
- About half of the students played video games for 10 hours during a school week.
  - All of the students played at least 10 hours of video games during the school week.
  - About half of the class could have played video games from 10 to 20 hours a week or from 15 to 25 hours.

3. Suppose you know the following for a data set: minimum value is 130, the lower quartile is 142, the IQR is 30, half of the data are less than 168, and the maximum value is 195.
- Think of a context for which these numbers might make sense.
  - Sketch a box plot.
  - Are there more data values above or below the median? Explain your reasoning.
4. 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

Breed	Speed (mph)
Irish Wolfhound	30
Dalmatian	30
Border Collie	30
Alaskan Husky	28
Giant Schnauzer	28
Jack Russell Terrier	25
Australian Cattle Dog	20

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

- Find the 5-number summary for this data set and use it to create a box plot of the speeds.
- Why is the median not in the center of the box?
- Write a few sentences telling your brother or sister about the speed of the fastest dogs.