Remote Learning Packet

NB: Please keep all work produced this week. Details regarding how to turn in this work will be forthcoming.

March 30 - April 3, 2020

Course: Math Fundamentals

Teacher(s): Ms. Schweizer rose.schweizer@greatheartsirving.org

Weekly Plan:

Monday, March 30
☐ Stem and Leaf Plots, Histograms: Pages 1-6

Tuesday, March 31
☐ MAD, IQR: Pages 7-10

Wednesday, April 1
☐ Comparing Graphs: Pages 11-14

Thursday, April 2
☐ Describing Distributions: Pages 15-18

Friday, April 3
☐ Cumulative Review pg. 362 1-41 odd

Statement of Academic Honesty

I affirm that the work completed from the packet is mine and that I completed it independently.

I affirm that, to the best of my knowledge, my child completed this work independently

_____
Student Signature

_____
Parent Signature

Monday, March 30

This is a review of Stem and Leaf Plots and Histograms. Read through Pages 1-6 in the Packet and answer ALL of the questions on a SEPARATE piece of paper. If necessary, copy any charts and histograms onto this separate piece of paper. Use complete sentences. Label each set of questions with the page number, example number, and question number. You do not have to copy down the original question.
For example:
Page 6, Example 3
1.
2.
3.

Tuesday, March 31

Spend some more time exploring the difference between the MAD and the IQR of data sets. Read through pages 7-10 of the packet and answer ALL of the questions, either in the packet itself or on a separate piece of paper, carefully labelling each question. Use complete sentences.
Remember to use your notes and previous examples we have worked through together, this is not a quiz! You should be using all of your available resources.

Wednesday, April 1

Now that we've reviewed the different ways of organizing and evaluating data, compare the different methods! Looking at the different types of graphs, compare the information you can learn from each one. Read through pages 11-14 of the packet and answer ALL of the questions either in the packet or on a separate piece of paper. Use complete sentences.

Thursday, April 2

A final day with Statistics. Incorporate and apply all that you have learned. Read through pages 15-18 of the packet and answer ALL of the questions, either in the packet or on a separate piece of paper. Use complete sentences.

Friday, April 3

Do the Cumulative Review at the end of Chapter 10, page 362, problems 1-41 odd. Like normal, these questions should be completed on a separate piece of paper, copying down the original question, in pencil, and showing all of your work.
Once you have completed the problems, correct your work IN PEN and write the corrections you are able to make (also in pen) just like you would in class.

Just for fun:

Sudoku Puzzle

Fill in the grid with digits in such a manner that every row, every column and every 3x3 box accommodates the digits 1-9, without repeating any.

4		7		3	2	5	8	
5	1		8				3	
	6			1	7	4	9	
	4		3		5	2		6
7	3		9	2	6			8
2	8					3	5	
6				5	9	8		
	2		4			7	1	5
3	5	1		7	8			4

Answer Key for Cumulative Review on page 362 (This is in the textbook)

1. 126

3. 29

5. 4.24

7. 8.14

9. 3.2

11. 2/25

13. 5

15. 1 ⅞

17. 54

19. 2.16

21. 39.48

23. 38.5 ft^2

25. 456 m^2

27. 135

29. 34

31. 6.7

33. 6.56

35. 13 23/100

37. 0.8

39. 75%

41. 85

Example 2: Creating a Stem-and-Leaf Plot
A line plot is good if there are not too many of possible values. For example, consider what would happen if the previous example were about number of *minutes* slept instead of number of *hours* slept. Consider the following data from a separate sleep study:

Number of Minutes Slept		
298	305	310
362	365	405
421	463	471
498	501	513
515	535	536
539	546	548
580	582	607
652	655	1012

The number of possible minutes ranges from 301 to 1012, which means we would have to place *a lot of labels on the lines graph*. Moreover, no value is actually repeated so there would only be one dot (or no dots) at each label. The line plot is not a very good way of displaying this data.

One way to display the data is to group the numbers together by using a stem-and-leaf plot. In a stem-and-leaf plot, the "leaves" are represented by the last digit, the last two digits, maybe the last three digits, etc. The choice of digits is up to the statistician and depends on the data set, but all leaves have to be the same number of digits. The "stem" is everything else, i.e. all the digits that are *not* in the leaf. We then display the data in something that resembles a table.

For our example, we will take the leaf to be the last two digits and the stem to be everything else. Notice that "1012" will be the only data point with a stem that is two digits long; all other data have a one-digit stem. We can now start to fill in our table.

For example, the "298" has a stem of "2" and a leaf of "98". Our stem and leaf plot begins like this:

Number of Minutes Slept	
2	98
3	
4	
5	
6	
7	
8	
9	
10	

We then write the other data point in their proper place and format, but we also keep them ordered. For example, the 300s would fill in like this:

Number of Minutes Slept	
2	98
3	05 10 62 65
4	
5	
6	
7	
8	
9	
10	

Take a moment to fill in the rest of the data to complete the stem-and-leaf plot. Notice that it looks something like a bar graph using numbers instead of bars.

With your class, answer the following questions:

1. If the leaves were one-digit long, why would the plot become cumbersome?
2. What is the most common interval for minute of sleep?
3. Describe the shape of the plot once it is completed.
4. What number do you think could describe the center of the data?
5. The data point in with the stem "10" is a very large number of minutes to be sleeping in a single day. It is an "outlier." What do you think could explain this extreme point?
6. Describe how you could start with a stem-and-leaf plot and reconstruct the original data set. Notice that you cannot do this with a bar graph (assuming there are ranges of data for each bar, i.e. a "histogram").

Statistics: Histograms

All of the materials presented here are adapted from EngageNY, an open source collection of curricular materials.

Example 1: Creating a Histogram

The boys' and girls' basketball teams at Roosevelt Middle School wanted to raise money to help buy new uniforms. They decided to sell baseball caps with the school logo on the front to family members and other interested fans. To obtain the correct cap size, students had to measure the head circumference (distance around the head) of the adults who wanted to order a cap. The following data set represents the head circumferences, in millimeters (mm), of the adults.

513, 525, 531, 533, 535, 535, 542, 543, 546, 549, 551, 552, 552, 553,
554, 555, 560, 561, 563, 563, 563, 565, 565, 568, 568, 571,571, 574,
577, 580, 583, 583,584, 585, 591, 595, 598, 603, 612, 618

The caps come in six sizes: XS, S, M, L, XL, and XXL. Each cap size covers an interval of head circumferences. The cap manufacturer gave students the table below that shows the interval of head circumferences for each cap size (s). (Pay close attention to the inequality signs.)

Cap Sizes	Interval of Head Circumferences (millimeters)	Tally	Frequency
XS			
S			
M			
L			
XL			
XXL			

Answer the following as a class.

1. What size cap would someone with a head circumference of 570 mm need?

2. Complete the tally and frequency columns in the table in Example 1 to determine the number of each size cap students need to order for the adults who wanted to order a cap.

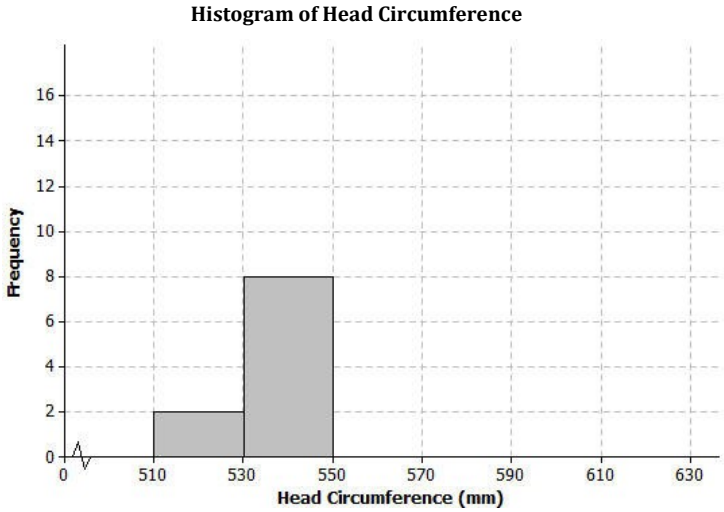
3. What head circumference would you use to describe the center of the data?

A histogram is a graph that is like a bar graph except that the horizontal axis is a number line that is marked off in equal intervals.

To make a histogram:

1. Draw a horizontal line, and mark the intervals.
2. Draw a vertical line, and label it Frequency.
3. Mark the Frequency axis with a scale that starts at *0* and goes up to something that is greater than the largest frequency in the frequency table.
4. For each interval, draw a bar over that interval that has a height equal to the frequency for that interval.

The first two bars of the histogram have been drawn below.



Answer the following questions as a class.

1. Complete the histogram by drawing bars whose heights are the frequencies for the other intervals.

2. Based on the histogram, describe the center of the head circumferences.

3. How would the histogram change if you added head circumferences of 551 mm and 569 mm to the data set?

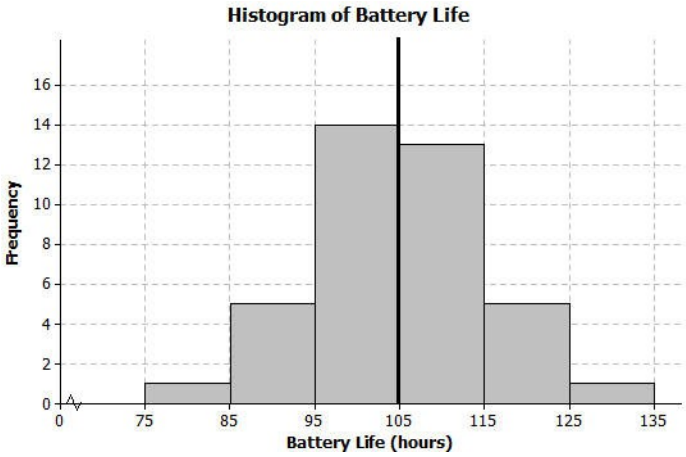
4. Because the 40 head circumference values were given, you could have constructed a dot plot to display the head circumference data. What information is lost when a histogram is used to represent a data distribution instead of a dot plot?

5. Suppose that there had been 200 head circumference measurements in the data set. Explain why you might prefer to summarize this data set using a histogram rather than a dot plot.

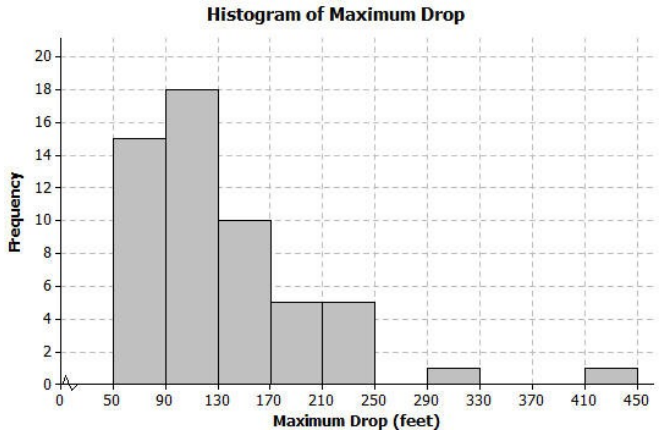
Example 2: The Shape of a Histogram

A histogram is useful to describe the shape of the data distribution. It is important to think about the shape of a data distribution because depending on the shape, there are different ways to describe important features of the distribution, such as center and variability.

A group of students wanted to find out how long a certain brand of AA batteries lasted. The histogram below shows the data distribution for how long (in hours) that some AA batteries lasted. Looking at the shape of the histogram, notice how the data mound up around a center of approximately 105 hours. We would describe this shape as mound shaped or symmetric. If we were to draw a line down the center, notice how each side of the histogram is approximately the same, or a mirror image of the other. This means the histogram is approximately symmetrical.

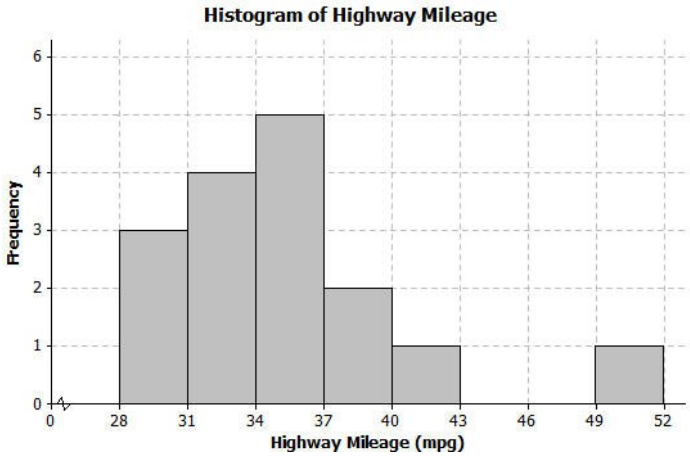


Another group of students wanted to investigate the maximum drop length for roller coasters. The histogram below shows the maximum drop (in feet) of a selected group of roller coasters. This histogram has a skewed shape. Most of the data are in the intervals from 50 feet to 170 feet. But there is one value that falls in the interval from 290 feet to 330 feet and one value that falls in the interval from 410 feet to 550 feet. These two values are unusual (or not typical) when compared to the rest of the data because they are much greater than most of the data.



Example 3: The Shape of a Histogram

The histogram shows the highway miles per gallon of different compact cars.
Answer the following questions as a class.



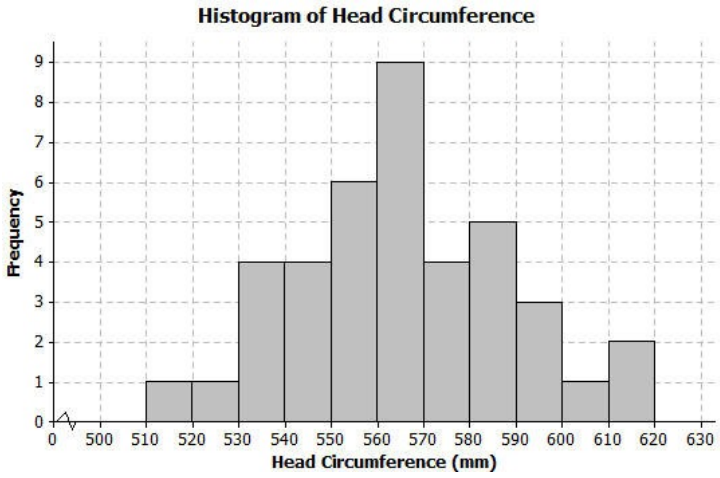
1. Describe the shape of the histogram as approximately symmetric, skewed left, or skewed right.

2. Draw a vertical line on the histogram to show where the typical number of miles per gallon for a compact car would be.

3. What does the shape of the histogram tell you about miles per gallon for compact cars?

Example 4: Comparing Histograms

Look back at the data set and histogram from *Example 1*. Another student decided to organize the head circumference data by changing the width of each interval to be 10 instead of 20. Below is the histogram that the student made.



Answer the following questions as a class.

1. Describe the shape of the *original* head circumference histogram that we completed in *Example 1* as approximately symmetric, skewed left, or skewed right.

2. How does this new histogram compare with the histogram of the head circumferences that you completed in *Example 1*?

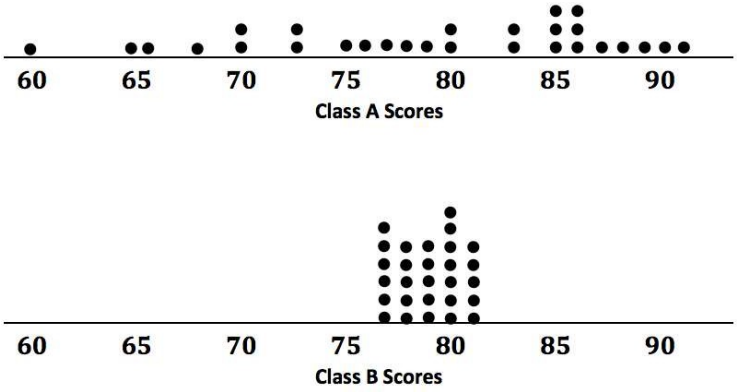
3. Describe the shape of this new histogram as approximately symmetric, skewed left, or skewed right.

4. How many head circumferences are in the interval from 570 to 590 mm?

5. In what interval would a head circumference of 571 mm be included? In what interval would a head circumference of 610 mm be included?

In Class Exercise

Suppose that two classes of students took the same test, and their grades (based on 100 points) are shown in the following dot plots. The mean score for each distribution is 79 points. Would you rather be in Class A or Class B if you had a score of 79?



Looking at the dot plots, which class has the greater MAD? Explain without actually calculating the MAD.

If Liz had one of the highest scores in her class, in which class would she rather be? Explain your reasoning.

If Logan scored below average, in which class would he rather be? Explain your reasoning.

Your little brother asks you to replace the battery in his favorite remote control car. The car is constructed so that it is difficult to replace its battery. Your research of the lifetimes (in hours) of two different battery brands (A and B) shows the following lifetimes for 20 batteries from each brand:

A	12	14	14	15	16	17	17	18	19	20	21	21	23	23	24	24	24	25	26	27
B	18	18	19	19	19	19	19	19	20	20	20	20	20	21	21	21	21	22	22	22

To help you decide which battery to purchase, start by drawing a dot plot of the lifetimes for each brand.

Find the mean battery lifetime for each brand, and compare them.

Looking at the variability in the dot plot for each data set, give one reason you might choose Brand A. What is one reason you might choose Brand B? Explain your reasoning.

The Interquartile Range

Data was collected from three restaurants on the number of french fries in a large bag. The medians of the top half and the medians of the bottom half of the data for each of three restaurants are as follows: Restaurant A: 87.5 and 77; Restaurant B: 83 and 76; Restaurant C: 84 and 78. The difference between the medians of the two halves is called the interquartile range, or IQR.

1. What is the IQR for each of the three restaurants?

2. Which of the restaurants had the smallest IQR, and what does that tell you?

3. The median of the bottom half of the data is called the lower quartile (denoted by Q1), and the median of the top half of the data is called the upper quartile (denoted by Q3). About what fraction of the data would be between the lower and upper quartiles? Explain your thinking.

4. Why do you think that the median of the top half of the data is called the upper quartile and the median of the bottom half of the data is called the lower quartile?

1. Mark the quartiles for each restaurant on the graphs below.

2. Does the IQR help you decide which of the three restaurants seems most likely to really have 82 fries in a typical large bag? Explain your thinking.

Finding the IQR
Consider the data:

1, 1, 3, 4, 6, 6, 7, 8, 10, 11, 11, 12, 15, 15, 17, 17, 17

Put the data in order from smallest to largest.

1. Find the minimum and maximum.

2. Find the median.

3. Find the lower quartile and upper quartile.

4. Calculate the IQR by finding the difference between Q3 and Q1.

Statistics: Comparing Graphs

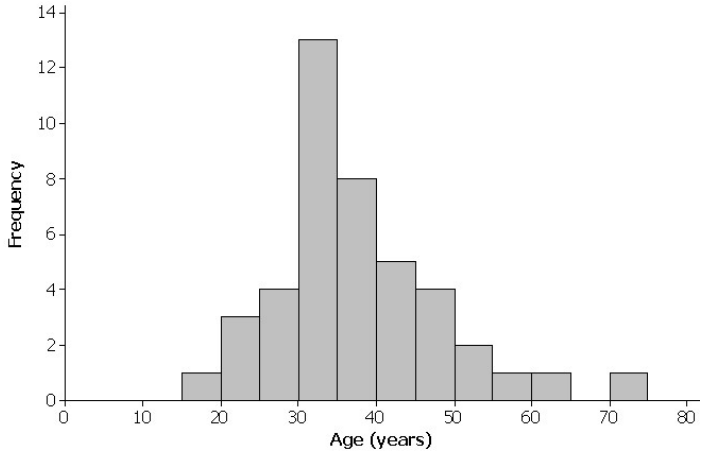
All of the materials presented here are adapted from EngageNY, an open source collection of curricular materials.

Summary Information from Graphs

Here is a data set of the ages (in years) of 43 participants who ran in a 5-kilometer race.

20	30	30	35	36	34	38	46
45	18	43	23	47	27	21	30
32	32	31	32	36	74	41	41
51	61	50	34	34	34	35	28
57	26	29	49	41	36	37	41
38	30	30					

Here are some summary statistics, a dot plot, and a histogram for the data:
Minimum = 18, Q1 = 30, Median = 35, Q3 = 41, Maximum = 74; Mean = 36.8, MAD = 8.1



1. Based on the histogram, would you describe the shape of the data distribution as approximately symmetric or as skewed? Would you have reached this same conclusion looking at the dot plot?

2. If there had been 500 participants instead of just 43, would you use a dot plot or a histogram to display the data?

3. What is something you can see in the dot plot that is not as easy to see in the histogram?

4. Do the dot plot and the histogram seem to be centered in about the same place?

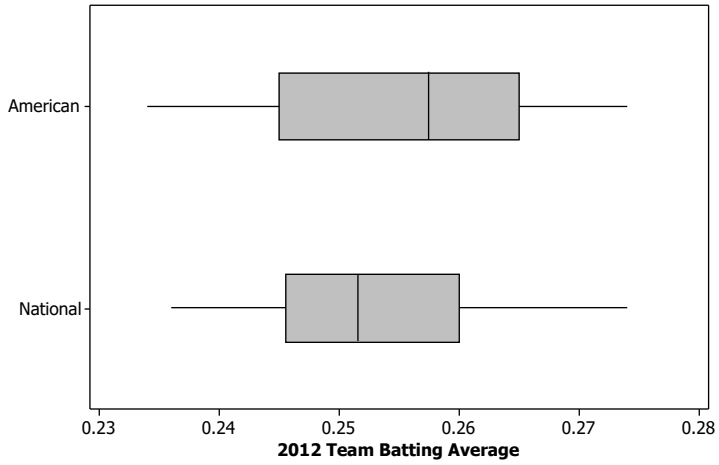
5. Do both the dot plot and the histogram convey information about the variability in the age distribution?

6. If you did not have the original data set and only had the dot plot and the histogram, would you be able to find the value of the median age from the dot plot?

7. Explain why you would only be able to estimate the value of the median if you only had a histogram of the data.

Comparing Box Plots

In 2012, Major League Baseball had two leagues: an American League of 14 teams and a National League of 16 teams. Jesse wondered if American League teams have higher batting averages and on-base percentages. (Higher values are better.) Use the following box plots to investigate.

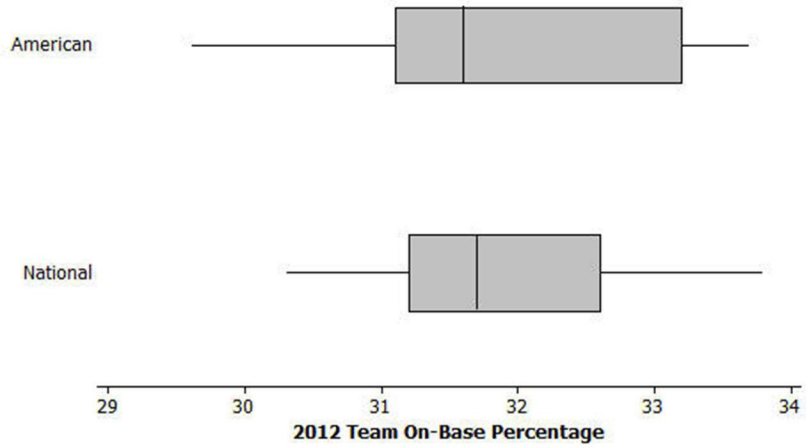


1. Was the highest American League team batting average very different from the highest National League team batting average? Approximately how large was the difference, and which league had the higher maximum value?

2. Was the range of American League team batting averages very different or only slightly different from the range of National League team batting averages?

3. Which league had the higher median team batting average? Given the scale of the graph and the range of the data sets, does the difference between the median values for the two leagues seem to be small or large? Explain why you think it is small or large.

4. Based on the box plots below for on-base percentage, which three summary values (from the five-number summary) appear to be the same or virtually the same for both leagues?



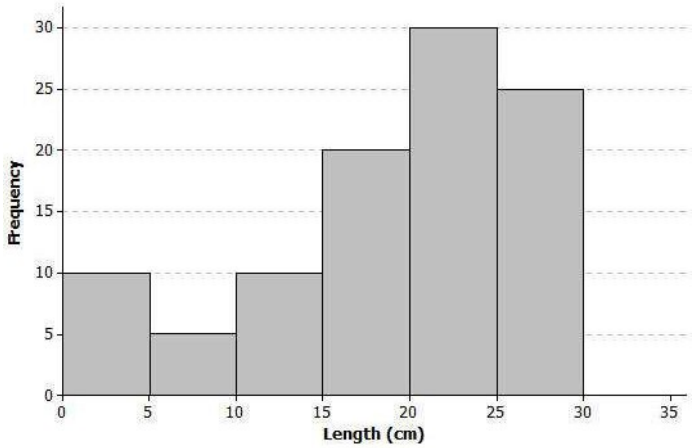
5. Which league's data set appears to have less variability? Explain.

6. Recall that Jesse wondered if American League teams have higher batting averages and on-base percentages. Based on the box plots given above, what would you tell Jesse?

Statistics: Describing Distributions

All of the materials presented here are adapted from EngageNY, an open source collection of curricular materials.

Scientists collected data from many yellow perch because they were concerned about the survival of the yellow perch. Scientists captured yellow perch from a lake in this region. They recorded data on each fish and then returned each fish to the lake. Consider the following histogram of data on the length (in centimeters) for a sample of yellow perch.



1. What statistical question could be answered based on this data distribution?

2. Use the histogram to complete the following table:

Length of Fish in Centimeters (cm	Number of Fish
0 '.S l < 5	
5 '.S l < 10	
10 '.S l < 15	
15 '.S l < 20	
20 '.S l < 25	
25 '.S l < 30	

3. The length of each fish in the sample was measured and recorded before the fish was released back into the lake. How many yellow perch were measured in this sample?

4. Would you describe the distribution of the lengths of the fish in the sample as a skewed distribution or as an approximately symmetric distribution? Explain your answer.

5. What percentage of fish in the sample were less than 10 centimeters in length?

6. If the smallest fish in this sample was 2 centimeters in length, what is your estimate of an interval of lengths that would contain the lengths of the shortest 25% of the fish? Explain how you determined your answer.

7. If the length of the largest yellow perch was 29 centimeters, what is your estimate of an interval of lengths that would contain the lengths of the longest 25% of the fish?

8. Estimate the median length of the yellow perch in the sample. Explain how you determined your estimate.

9. Based on the shape of this data distribution, do you think the mean length of a yellow perch would be greater than, less than, or the same as your estimate of the median? Explain your answer.

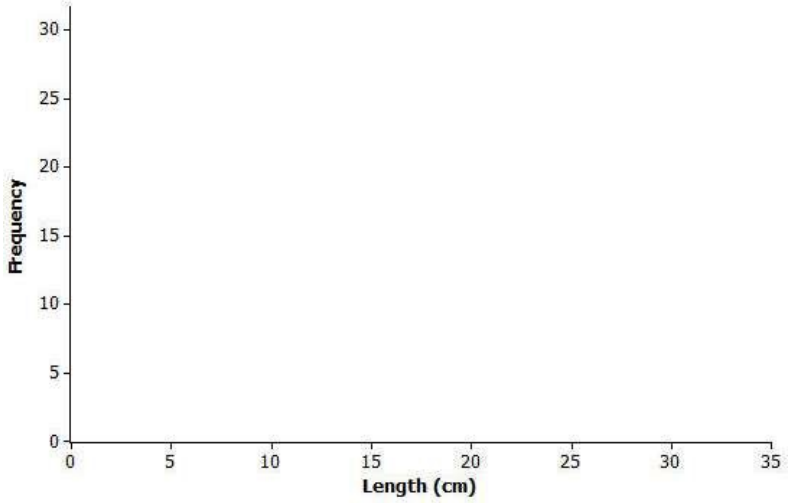
10. Recall that the mean length is the balance point of the distribution of lengths. Estimate the mean length for this sample of yellow perch.

11. The length of a yellow perch is used to estimate the age of the fish. Yellow perch typically grow throughout their lives. Adult yellow perch have lengths between 10 and 30 centimeters. How many of the yellow perch in this sample would be considered adult yellow perch? What percentage of the fish in the sample are adult fish?

What Would a Better Distribution Look Like?

Yellow perch are part of the food supply of larger fish and other wildlife in the Great Lakes region. Why do you think that the scientists worried when they saw the histogram of fish lengths given previously.

Sketch a histogram representing a sample of 100 yellow perch lengths that you think would indicate the perch are not in danger of dying out.

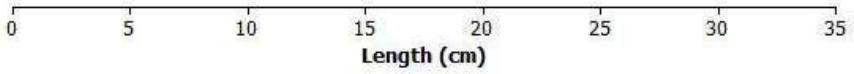


1. In several previous lessons, you described a data distribution using the five-number summary. Use the histogram and your answers to the questions in previous exercises to provide estimates of the values for the five-number summary for this sample:

   Minimum (min) value =
   Q1 value
   Median =
   Q3 value
   Maximum (max) value =

2. Based on the five-number summary, what is an estimate of the value of the interquartile range(IQR for this data distribution?

3. Sketch a box plot representing the lengths of the yellow perch in this sample.



4. Which measure of center, the median or the mean, is closer to where the lengths of yellow perch tend to cluster?

5. What value would you report as a typical length for the yellow perch in this sample?

6. The mean absolute deviation (or MAD) or the interquartile range IQR) is used to describe the variability in a data distribution. Which measure of variability would you use for this sample of perch? Explain your answer.