A Story of Ratios®

Eureka Math™

Grade 6, Module 6

Student File_B

Contains Exit Ticket and Assessment Materials

Exit Ticket Packet

Name _____   Date_____

Lesson 1: Posing Statistical Questions

1. Indicate whether each of the following two questions is a statistical question. Explain why or why not.

    a.   How much does Susan's dog weigh?

    b.   How much do the dogs belonging to students at our school weigh?

2. If you collected data on the weights of dogs, would the data be numerical or categorical? Explain how you know the data are numerical or categorical.

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Lesson 2: Displaying a Data Distribution

Exit Ticket

A sixth-grade class collected data on the number of letters in the first names (name lengths) of all the students in class. Here is the dot plot of the data they collected:
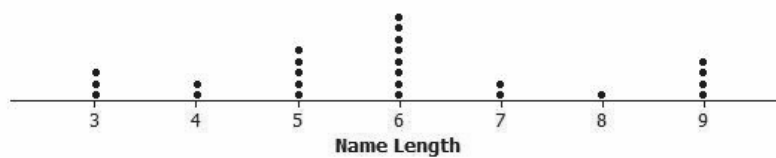
1. How many students are in the class?

2. What is the shortest name length?

3. What is the longest name length?

4. What name length occurs most often?

5. What name length describes the center of the data?

Name _____   Date _____

Lesson 3: Creating a Dot Plot

Exit Ticket

A biologist collected data to answer the question, "How many eggs do robins lay?"

The following is a frequency table of the data she collected:

Number of Eggs	Tally	Frequency
1	| |	
2	‖‖ ‖‖ | |	
3	‖‖ ‖‖ ‖‖ | | |	
4	‖‖ | | | |	
5	|	

1. Complete the frequency column.

2. Draw a dot plot of the data on the number of eggs a robin lays.

3. What number of eggs describes the center of the data?

Name _____   Date _____

Lesson 4: Creating a Histogram

The frequency table below shows the length of selected movies shown in a local theater over the past six months.

Length of Movie (minutes)	Tally	Frequency
80−< 90	|	1
90−< 100	||||	4
100−< 110	⊦⊦⊦ ||	7
110−< 120	⊦⊦⊦	5
120−< 130	⊦⊦⊦ ||	7
130−< 140	|||	3
140−< 150	|	1

1. Construct a histogram for the length of movies data.

Histogram of Movie Lengths
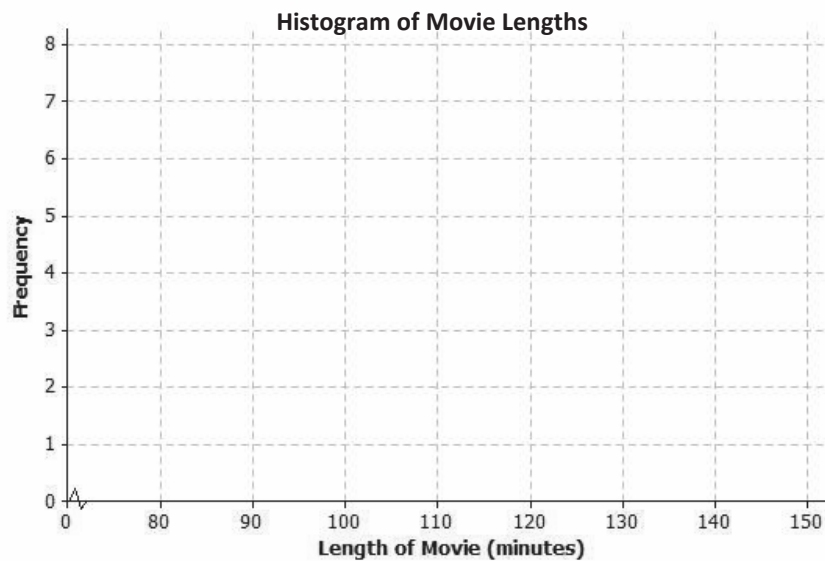
2. Describe the shape of the histogram.

3. What does the histogram tell you about the length of movies?

Name _____   Date _____

Lesson 5: Describing a Distribution Displayed in a Histogram

Exit Ticket

Calculators are allowed for completing your problems.

Hector's mom had a rummage sale, and after she sold an item, she tallied the amount of money she received for the item. The following is the frequency table Hector's mom created.

Amount of Money Received for the Item	Tally	Frequency	Relative Frequency
$0−< $5	||	2	
$5−< $10	|	1	
$10−< $15	||||	4	
$15−< $20	⦀⦀ ⦀⦀	10	
$20−< $25	⦀⦀	5	
$25−< $30	|||	3	
$30−< $35	||	2	

a.   What was the total number of items sold at the rummage sale?

b.   Complete the relative frequency column. Round the relative frequencies to the nearest thousandth.

c.   What percentage of the items Hector's mom sold were sold for $15 or more but less than $20?

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Lesson 6: Describing the Center of a Distribution Using the Mean

1. If a class of 27 students had a mean of 72 on a test, interpret the mean of 72 in the sense of a fair share measure of the center of the test scores.

2. Suppose that your school's soccer team has scored a mean of 2 goals in each of 5 games.
    a. Draw a representation using cubes that displays that your school's soccer team has scored a mean of 2 goals in each of 5 games. Let 1 cube stand for 1 goal.

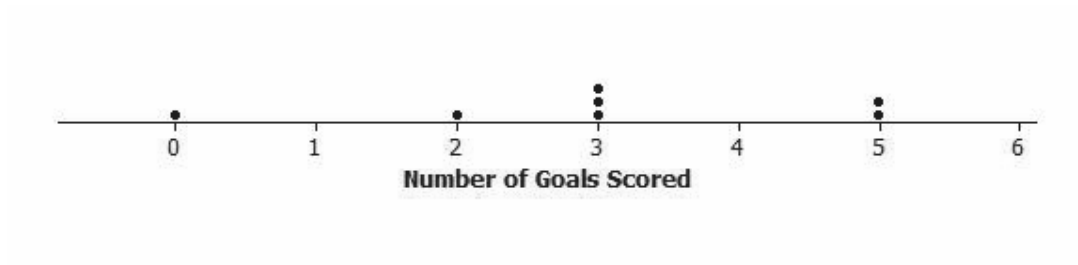   b. Draw a dot plot that displays that your school's soccer team has scored a mean of 2 goals in each of 5 games.

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Lesson 7: The Mean as a Balance Point

Exit Ticket

The dot plot below shows the number of goals scored by a school's soccer team in 7 games so far this season.

Number of Goals Scored

Use the balancing process to explain why the mean number of goals scored is 3.

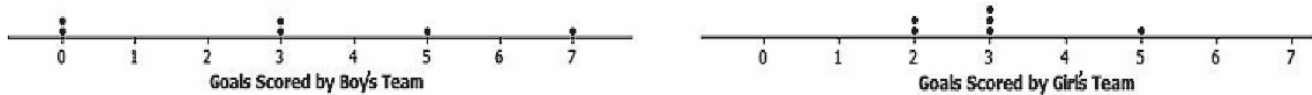Name _____   Date _____

Lesson 8: Variability in a Data Distribution

Exit Ticket

1. Consider the following statement: Two sets of data with the same mean will also have the same variability. Do you agree or disagree with this statement? Explain.

2. Suppose the dot plot on the left shows the number of goals a boys' soccer team has scored in 6 games so far this season and the dot plot on the right shows the number of goals a girls' soccer team has scored in 6 games so far this season.

Goals Scored by Boy's Team   Goals Scored by Girl's Team

   a. Compute the mean number of goals for each distribution.

   b. For which distribution, if either, would the mean be considered a better indicator of a typical value? Explain your answer.

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Lesson 9: The Mean Absolute Deviation (MAD)

Exit Ticket

1. The mean absolute deviation (MAD) is a measure of variability for a data set. What does a data distribution look like if its MAD equals zero? Explain.

2. Is it possible to have a negative value for the MAD of a data set?

3. Suppose that seven students have the following numbers of pets: 1, 1, 1, 2, 4, 4, 8.

   a. The mean number of pets for these seven students is 3 pets. Use the following table to find the MAD for this distribution of number of pets.

Student	Number of Pets	Deviation from the Mean (distance and direction)	Absolute Deviation (distance from the mean)
1	1		
2	1		
3	1		
4	2		
5	4		
6	4		
7	8		
Sum			

   b. Explain in words what the MAD means for this data set.
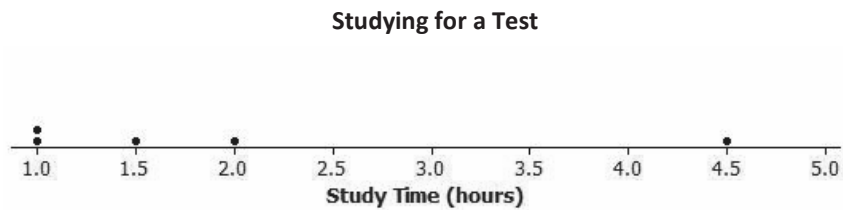
Name _____   Date _____

Lesson 10: Describing Distributions Using the Mean and MAD

Exit Ticket

1. A dot plot of times that five students studied for a test is displayed below.

Studying for a Test

Study Time (hours)

a. Calculate the mean number of hours that these five students studied. Then, use the mean to calculate the absolute deviations, and complete the table.

Student	Aria	Ben	Chloe	Dellan	Emma
Number of Study Hours	1	1	1.5	2	4.5
Absolute Deviation					

b. Find and interpret the MAD for this data set.

2. The same five students are preparing to take a second test. Suppose that the numbers of study hours were the same except that Ben studied 2.5 hours for the second test (1.5 hours more), and Emma studied only 3 hours for the second test (1.5 hours less).

a. Without doing any calculations, is the mean for the second test the same as, greater than, or less than the mean for the first test? Explain your reasoning.

b. Without doing any calculations, is the MAD for the second test the same as, greater than, or less than the MAD for the first test? Explain your reasoning.

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Lesson 11: Describing Distributions Using the Mean and MAD

Exit Ticket

You need to decide which of two brands of chocolate chip cookies to buy. You really love chocolate chip cookies. The numbers of chocolate chips in each of five cookies from each brand are as follows:

Cookie	1	2	3	4	5
ChocFull	17	19	18	18	18
AllChoc	22	15	14	21	18

a.   Draw a dot plot for each set of data that shows the distribution of the number of chips for that brand. Use the same scale for both of your dot plots (one that covers the span of both distributions).

b.   Find the mean number of chocolate chips for each of the two brands. Compare the means.

c.   Looking at your dot plots and considering variability, which brand do you prefer? Explain your reasoning.

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Lesson 12: Describing the Center of a Distribution Using the Median

Exit Ticket

1. What is the median age for the following data set representing the ages of students requesting tickets for a summer band concert? Explain your reasoning.

    13 14 15 15 16 16 17 18 18

2. What is the median number of diseased trees from a data set representing the numbers of diseased trees on each of 12 city blocks? Explain your reasoning.

    11 3 3 4 6 12 9 3 8 8 8 1

3. Describe how you would find the median for a set of data that has 35 values. How would this be different if there were 36 values?

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Lesson 13: Describing Variability Using the Interquartile Range (IQR)

Exit Ticket

1. On the dot plot below, insert the following words in approximately the correct position.
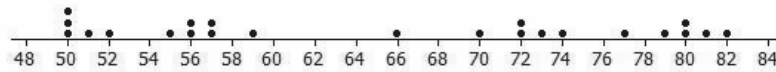
| Maximum | Minimum | IQR | Median | Lower Quartile (Q1) | Upper Quartile (Q3) |

2. Estimate the IQR for the data set shown in the dot plot.

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Lesson 14: Summarizing a Distribution Using a Box Plot

Exit Ticket

Sulee explained how to make a box plot to her sister as follows:

"First, you find the smallest and largest values and put a mark halfway between them, and then put a mark halfway between that mark and each end. So, if 10 is the smallest value and 30 is the largest value, you would put a mark at 20. Then, another mark belongs halfway between 20 and 10, which would be at 15. And then one more mark belongs halfway between 20 and 30, which would be at 25. Now, you put a box around the three middle marks, and draw lines from the box to the smallest and largest values."

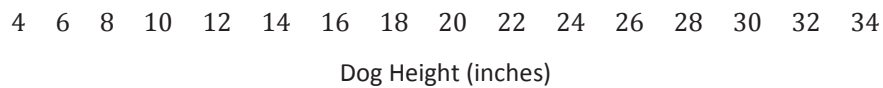Here is her box plot. What would you say to Sulee?
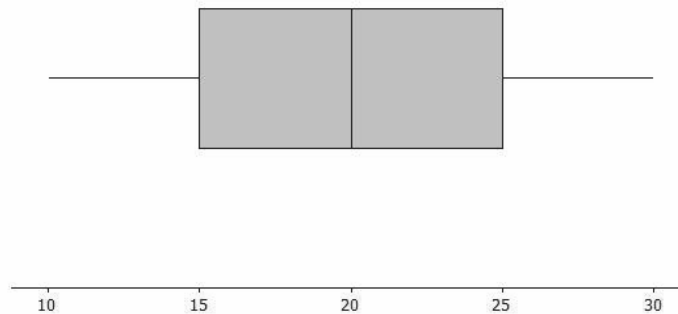
Name _____   Date_____

Lesson 15: More Practice with Box Plots

Exit Ticket

Given the following information, create a box plot, and find the IQR.

For a large group of dogs, the shortest dog was 6 inches, and the tallest was 32 inches. One-half of the dogs were taller than 18 inches. One-fourth of the dogs were shorter than 15 inches. The upper quartile of the dog heights was 23 inches.
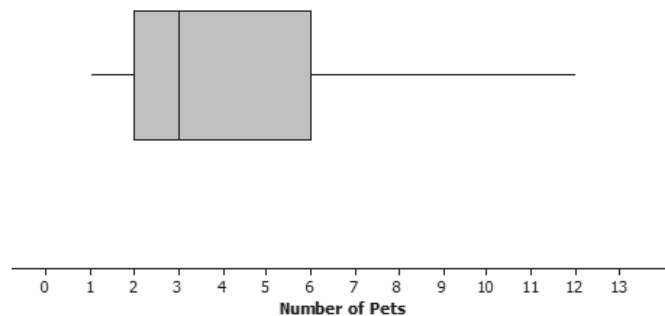
```
        _____
        4   6   8  10  12  14  16  18  20  22  24  26  28  30  32  34
                              Dog Height (inches)
```

Name _____   Date_____

Lesson 16: Understanding Box Plots

Exit Ticket

Data on the number of pets per family for students in a sixth-grade class are summarized in the box plot below:

1. Can you tell how many families have two pets? Explain why or why not.

2. Given the box plot above, which of the following statements are true? If the statement is false, modify it to make the statement true.

    a.   Every family has at least one pet.

    b.   About one-fourth of the families have six or more pets.

    c.   Most of the families have three pets.

    d.   About half of the families have two or fewer pets.

    e.   About three-fourths of the families have two or more pets.

Name _____   Date _____

Lesson 17: Developing a Statistical Project

Exit Ticket

1.   What is a statistical question?

2.   What are the four steps in a statistical investigation?

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Lesson 18: Connecting Graphical Representations and Numerical Summaries

1. Many states produce maple syrup, which requires tapping sap from a maple tree. However, some states produce more pints of maple syrup per tap than other states. The following dot plot shows the pints of maple syrup yielded per tap in each of the 10 maple syrup–producing states in 2012.

Maple Syrup Yield per Tap by State (10 States - 2012 USDA Summary)

**Maple Syrup Yield per Tap (pints)**
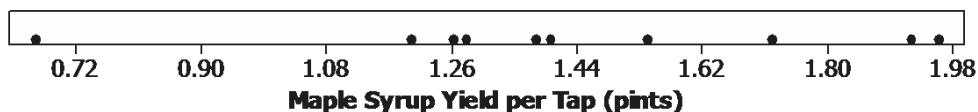
Which *one* of the three sets of summary measures below could be correct summary measures for the data set displayed in the dot plot? For each choice that you eliminate, give at least one reason for eliminating it as a possibility.

a. Minimum = 0.66, Q1 = 1.26, Median = 1.385, Q3 = 1.71, Maximum = 1.95, Range = 2.4; Mean = 1.95, MAD = 0.28

b. Minimum = 0.66, Q1 = 1.26, Median = 1.71, Q3 = 1.92, Maximum = 1.95, Range = 1.29; Mean = 1.43, MAD = 2.27

c. Minimum = 0.66, Q1 = 1.26, Median = 1.385, Q3 = 1.71, Maximum = 1.95, Range = 1.29; Mean = 1.43, MAD = 0.28

2. Which *one* of the three histograms below could be a histogram for the data displayed in the dot plot in Problem 1? For each histogram that you eliminate, give at least one reason for eliminating it as a possibility.
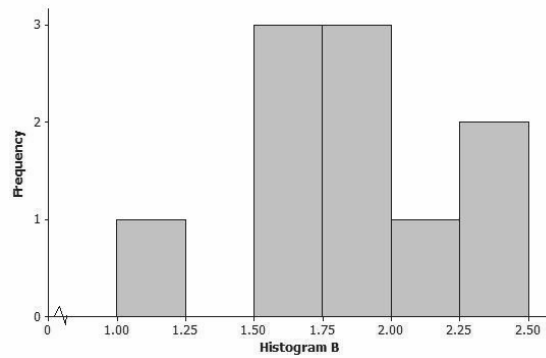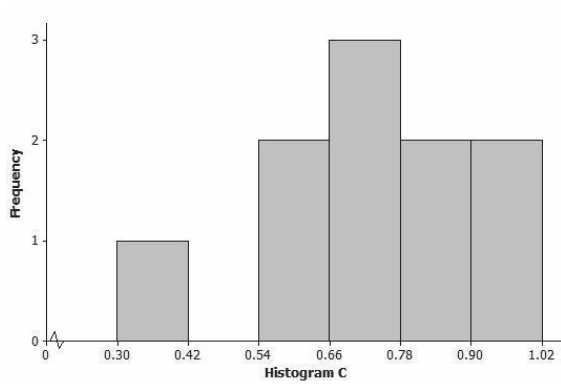
a.
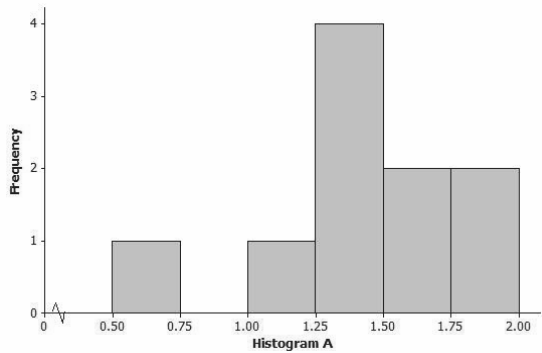
b.

c.

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Lesson 19: Comparing Data Distributions

Exit Ticket

Hay is used to feed animals such as cows, horses, and goats. Almost $\frac{1}{3}$ of the hay grown in the United States comes from just five states. Is this because these states have more acres planted in hay, or could it be because these states produce more hay per acre than other states? The following box plots show the distribution of hay produced (in tons) per acre planted in hay for three different regions: 22 eastern states, 14 midwestern states, and 12 western states.

Source: *United States Department of Agriculture National Agricultural Statistics Service Crop Production 2012 Summary*, ISSN: 1057-7823, p. 75, accessed May 5, 2013
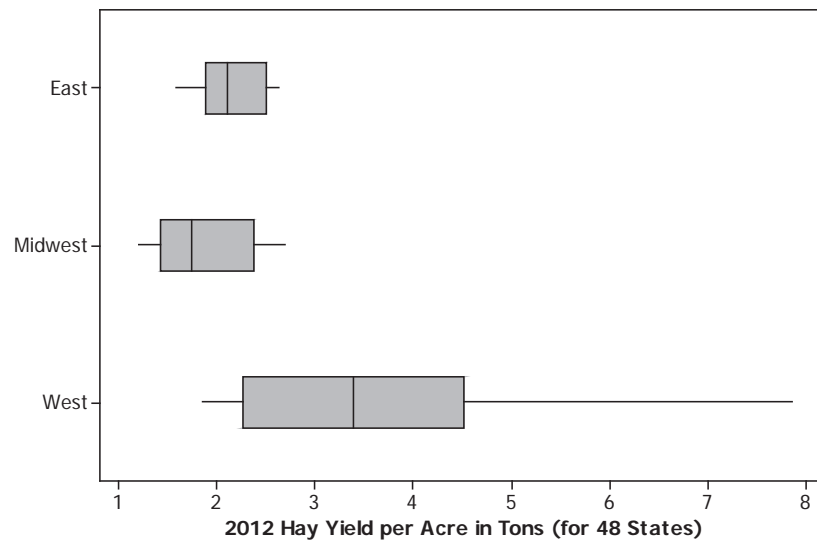
1.   Which of the three regions' data sets has the least variability? Which has the greatest variability? To explain how you chose your answers, write a sentence or two that supports your choices by comparing relevant summary measures (such as median and IQR) or aspects of the graphical displays (such as shape and variability).

2. True or false: The western state with the smallest hay yield per acre has a higher hay yield per acre than at least half of the midwestern states. Explain how you know this is true or how you know this is false.

3. Which region typically has states with the largest hay yield per acre? To explain how you chose your answer, write a sentence or two that supports your choice by comparing relevant summary measures or aspects of the graphical displays.

Name _____   Date_____

Lesson 20: Describing Center, Variability, and Shape of a Data Distribution from a Graphical Representation

Exit Ticket

1. Great Lake yellow perch continue to grow until they die.   What does the histogram in Example 1 indicate about the ages of the perch in the sample?

2. What feature of the histogram in Example 1 indicates that the values of the mean and the median of the data distribution will not be equal?

3. Adult yellow perch have lengths between 10 and 30 centimeters. Would a perch with a length equal to the median length be classified as an adult or a pre-adult fish? Explain your answer.

Name _____   Date_____

Lesson 21: Summarizing a Data Distribution by Describing Center, Variability, and Shape

Exit Ticket

Based on the statistical question you are investigating for your project, summarize the four steps you are expected to complete as part of the presentation of your statistical study.

Name _____   Date_____

Lesson 22: Presenting a Summary of a Statistical Project

Exit Ticket

After you have presented your study, consider what your next steps are by answering the following questions:

1.   What questions still remain after you concluded your statistical study?

2.   What statistical question would you like to answer next as a follow-up to this study?

3.   How would you collect the data to answer the new question you posed in Question 2?

Assessment Packet

Name _____   Date _____

1. For each of the following, identify whether or not it would be a valid *statistical question* you could ask about people at your school. Explain for each why it is, or is not, a statistical question.

   a.   What are a typical number of hours of television watched by students at your school last night?

   b.   What is the school principal's favorite television program?

   c.   Do most students at your school tend to watch at least one hour of television on the weekend?

   d.   What is the recommended amount of television specified by the American Pediatric Association?

2. In 2013, there were nine judges serving on the Supreme Court of the United States. The following table lists how long (the number of years) each judge had served on the court as of 2013.

Judge	Length of Service
Antonin Scalia	27
Anthony Kennedy	25
Clarence Thomas	22
Ruth Bader Ginsburg	20
Stephen Breyer	19
John Roberts	8
Samuel Alito	7
Sonia Sotomayor	4
Elena Kagan	3

a. Calculate the mean length of service for these nine judges. Show your work.

b. Calculate the mean absolute deviation (MAD) of the lengths of service for these nine judges. Show your work.

c. Explain why the mean may not be the best way to summarize a typical length of service for these nine judges.

3. The following table displays data on calories for several Chinese foods (from Center for Science in the Public Interest, tabulated by the *Philadelphia Inquirer*).

Dish	Dish Size	Calories	Dish	Dish Size	Calories
Egg Roll	1 roll	190	House Lo Mein	5 cups	1,059
Moo Shu Pork	4 pancakes	1,228	House Fried Rice	4 cups	1,484
Kung Pao Chicken	5 cups	1,620	Chicken Chow Mein	5 cups	1,005
Sweet and Sour Pork	4 cups	1,613	Hunan Tofu	4 cups	907
Beef with Broccoli	4 cups	1,175	Shrimp in Garlic Sauce	3 cups	945
General Tso's Chicken	5 cups	1,597	Stir-Fried Vegetables	4 cups	746
Orange (crispy) Beef	4 cups	1,766	Szechuan Shrimp	4 cups	927
Hot and Sour Soup	1 cup	112			

a. Round the Calories values to the nearest 100 calories, and use these rounded values to produce a dot plot of the distribution of the calories in these dishes.

b. Describe the distribution of the calories in these dishes.

c. Suppose you wanted to report data on calories per cup for different Chinese foods. What would be the calories per cup for Kung Pao chicken?

    d.   Could you calculate calories per cup for all of the foods listed in the table? Explain why or why not.

    e.   If you wanted to compare the healthiness of these foods in terms of calories, would you compare the calorie amounts or the calories per cup? Explain your choice.

4.   A father wanted some pieces of wood that were 10 inches long for a building project with his son. He asked the hardware store to cut some longer pieces of wood into 10-inch pieces. However, he noticed that not all of the pieces given to him were the same length. He then took the cut pieces of wood home and measured the length (in inches) of each piece. The table below summarizes the lengths that he found.

Length (inches)	8.50– < 8.75	8.75– < 9.00	9.00– < 9.25	9.25– < 9.50	9.50– < 9.75	9.75– < 10.00	10.00– < 10.25	10.25– < 10.50	10.50– < 10.75	12.00– < 12.25
Frequency	1	2	2	4	3	2	5	6	1	1

    a.   Create a histogram for these data.

    b.   Describe the shape of the histogram you created.

c. The father wanted to know whether the mean length was equal to 10 inches or if the wood cutter cut pieces that tended to be too long or tended to be too short. Without calculating the mean length, explain based on the histogram whether the mean board length should be equal to 10 inches, greater than 10 inches, or less than 10 inches. Explain what strategy you used to determine this.

d. Based on the histogram, should the mean absolute deviation (MAD) be larger than 0.25 inch or smaller than 0.25 inch? Explain how you made this decision.

e. Suppose this project was repeated at two different stores and the following two dot plots of board lengths were found. Would you have a preference for one store over the other store? If so, which store would you prefer, and why? Justify your answer based on the displayed distributions.
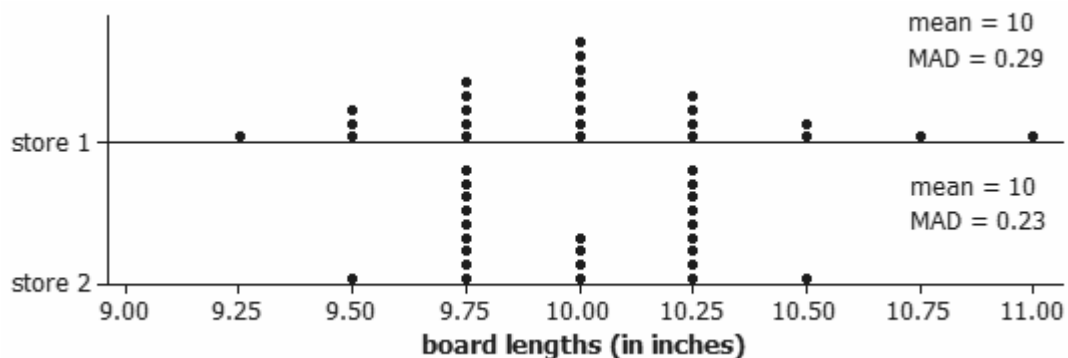
5. Suppose you are timing how long it takes a car to race down a wood track placed at a forty-five degree angle. The times for five races are recorded. The mean time for the five races is 2.75 seconds.

    a. What is the total time for the five races (the times of the five races summed together)?

    b. Suppose you learn that the timer malfunctioned on one of the five races. The result of the race had been reported to be 3.6 seconds. If you remove that time from the list and recompute the mean for the remaining four times, what do you get for the mean? Show your work.

Name _____   Date _____

1. A group of students were asked how many states they have visited in their lifetime. Below is a dot plot of their responses.

number of states
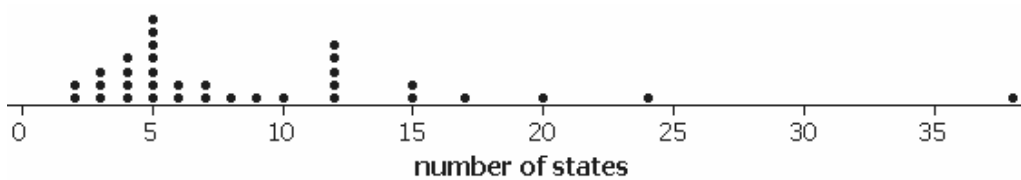
a. How many observations are in this data set?

b. In a few sentences, summarize this distribution in terms of shape, center, and variability.

c. Based on the dot plot above and without doing any calculations, circle the best response below, and then explain your reasoning.

    A. I expect the mean to be larger than the median.
    B. I expect the median to be larger than the mean.
    C. The mean and median should be similar.

    Explain:

d. To summarize the variability of this distribution, would you recommend reporting the interquartile range or the mean absolute deviation? Explain your choice.

e. Suppose everyone in the original data set visits one new state over summer vacation. Without doing any calculations, describe how the following values would change (i.e., larger by, smaller by, no change—be specific).
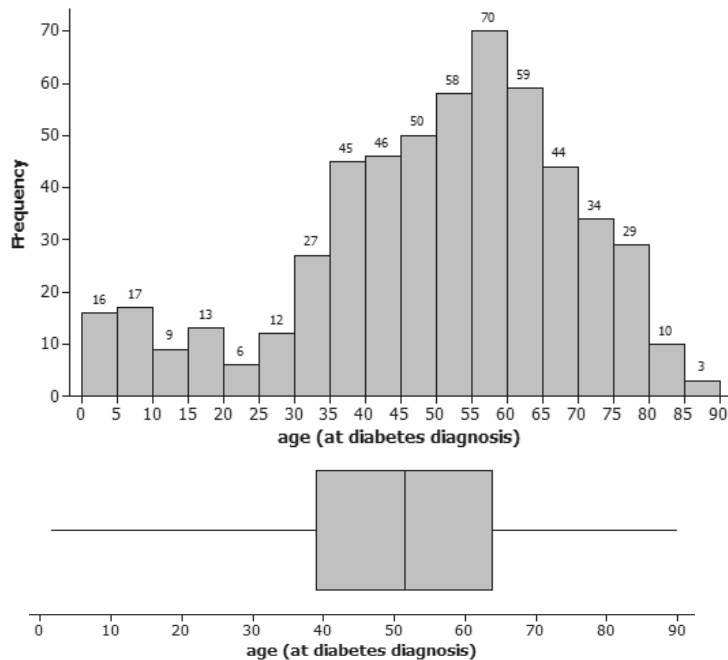
Mean:

Median:

Mean Absolute Deviation:

Interquartile Range:

2. Diabetes is a disease that occurs in both young and old people. The histogram and box plot below display the ages at which 548 people with diabetes first found out that they had this disease.

The American Diabetes Association has identified two types of diabetes:

- Type 1 diabetes is when the body does not produce insulin. Type 1 diabetes is usually first found in children and young adults (less than 20 years of age).
- Type 2 diabetes is when the body does not produce enough insulin and the cells do not respond to insulin. Type 2 diabetes is usually first found in older adults (50 years of age or older).

a. Explain how the histogram shows the two types of diabetes.

b. Estimate the percentage of these 548 people who found out they had the disease before age 20. Explain how you made your estimate.

c. Suggest a statistical question that the box plot of the age data would allow you to answer more quickly than the histogram would.

d. The interquartile range for these data is reported to be 24. Write a sentence interpreting this value in the context of this study.

3. The following table lists the diameters (in miles) of the original nine planets.

Planet	Diameter (in miles)
Mercury	3,030
Venus	7,520
Earth	7,926
Mars	4,217
Jupiter	88,838
Saturn	74,896
Uranus	31,762
Neptune	30,774
Pluto	1,428

a. Calculate the five-number summary (minimum, lower quartile, median, upper quartile, and maximum) of the planet diameters. Be sure to include measurement units with each value.

Minimum:

Lower quartile:

Median:

Upper quartile:

Maximum:

b. Calculate the interquartile range (IQR) for the planet diameters.

c.   Draw a box plot of the planet diameters.

d.   Would you classify the distribution of planet diameters as roughly symmetric or skewed? Explain.

e.   Pluto was recently reclassified as a *dwarf plant* because it is too small to clear other objects out of its path. The mean diameter with all nine planets is 27,821 miles, and the MAD is 25,552 miles. Use this information to argue whether or not Pluto is substantially smaller than the remaining eight planets.

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