Name _____ Date_____

Lesson 1: Posing Statistical Questions

Exit Ticket

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 it is numerical or categorical.
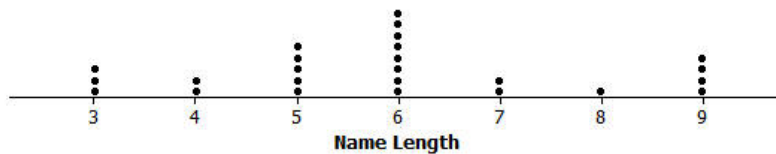
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Name _____   Date_____

Lesson 2: Displaying a Data Distribution

Exit Ticket

A 6th grade class collected data on the number of letters in the first names of all the students in class. Here is the dot plot of the data they collected:

Name Length

1.   How many students are in the class?

2.   What is the shortest name length?

3.   What is the longest name length?

4.   What is the most common name length?

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 collected data:

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

1. Complete the frequency column.

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

3. What number of eggs describes the center of the data?
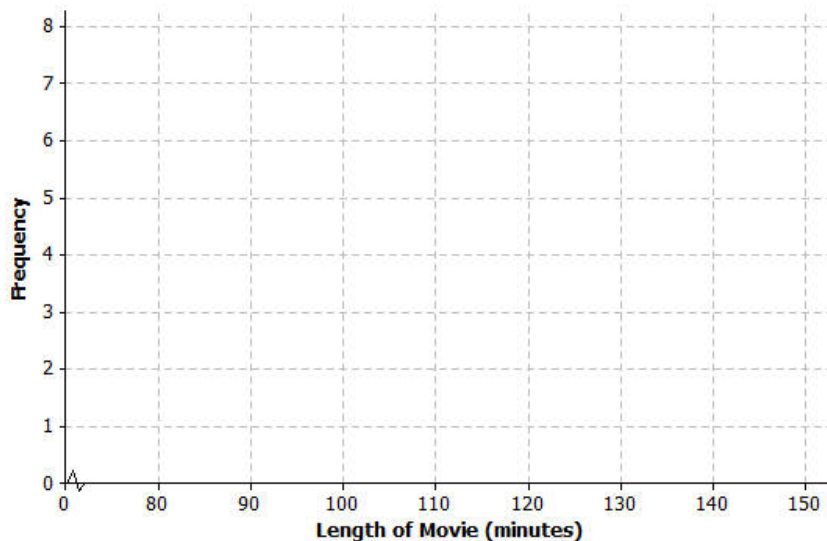
Name _____   Date_____

Lesson 4: Creating a Histogram

Exit Ticket

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

Length of Movie (min)	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.

2. Describe the shape of the histogram.

3. What does the shape 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 for how much money she sold the item. Following is the frequency table Hector's mom created:

Amount of Money the Item sold for	Tally	Frequency	Relative Frequency
$0−< 5	||	2	
$5−< $10	|	1	
$10−< $15	||||	4	
$15−< $20	ﬀﬀﬀﬀﬀ ﬀﬀﬀﬀﬀ	10	
$20−< $25	ﬀﬀﬀﬀﬀ	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 to the nearest thousandth.

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

Name _____   Date_____

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

Exit Ticket

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 one cube stand for one 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.

Name _____ Date_____

Lesson 7: The Mean as a Balance Point

Exit Ticket

1. If a class of 27 students has a mean score of 72 on a test, what is the sum of the 27 deviations of the scores from 72?

2. 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. List all of the deviations and calculate the sum of the deviations. Explain your answer.
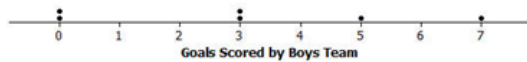
Name _____ Date_____

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 Boys Team   **Goals Scored by Girls Team**
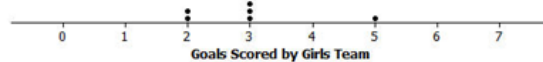
a. Compute the mean number of goals for each distribution.

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

Name _____   Date_____

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 number of pets: 1, 1, 1, 2, 4, 4, 8.

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

Student	# of Pets	Deviations	Absolute Deviations
1	1		
2	1		
3	1		
4	2		
5	4		
6	4		
7	8		
Sum			

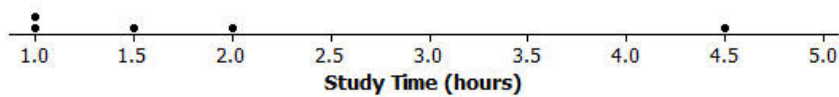   b. Explain in words what the MAD means for this data set.

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.

Study Time (hours)

   a. Use the table to determine the mean number of hours that these five students studied. Then, complete the table.

Student	Aria	Ben	Chloe	Dellan	Emma
Number of study hours	1	1	1.5	2	4.5
Deviations				0	
Absolute deviations					

   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 data 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, higher, or lower than the mean for the first test? Explain your reasoning.

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

Name _____   Date_____

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 number of chips for each brand. Use a scale for your dot plots that covers the same span for 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.

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 was the mean 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. There are nine judges currently serving on the Supreme Court of the United States. The following table lists how long (number of years) each judge has been serving 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.

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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	1059
Moo shu pork	4 pancakes	1228	House fried rice	4 cups	1484
Kung Pao chicken	5 cups	1620	Chicken chow mein	5 cups	1005
Sweet and sour pork	4 cups	1613	Hunan tofu	4 cups	907
Beef with broccoli	4 cups	1175	Shrimp in garlic sauce	3 cups	945
General Tso's chicken	5 cups	1597	Stir-fried vegetables	4 cups	746
Orange (crispy) beef	4 cups	1766	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 the calories per cup be for Kung Pao chicken?

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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.

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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 inches or smaller than 0.25 inches? 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.
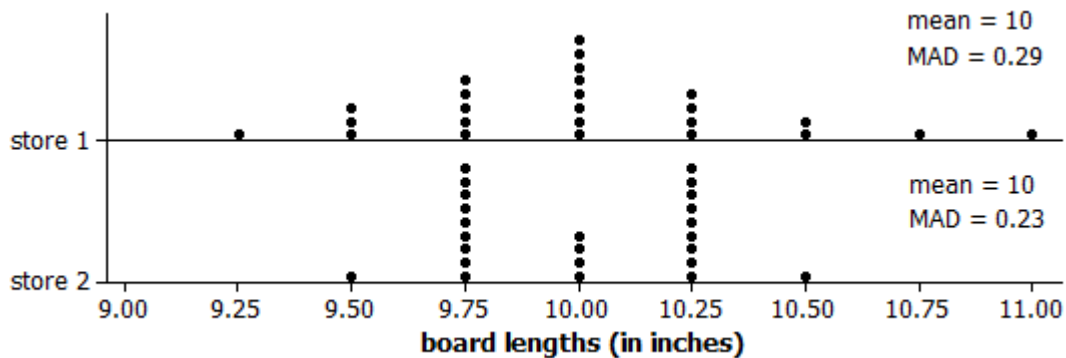
5. Suppose you are timing how long it takes a car to race down a wood track placed at a forty-five degree angle. The times for five races are recorded. The mean time for the five races is 2.75 seconds.

    a. What was 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 recomputed the mean for the remaining four times, what do you get for the mean? Show your work.

Name _____   Date_____

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 age of students requesting tickets for a summer band concert?

     13 14 15 15 16 16 17 18 18

2. What is the median number of diseased trees from a data set of diseased trees on 10 city blocks?

     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?

Name _____   Date_____

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

Exit Ticket

1. On the graph below, insert the following words in approximately the correct position.

   Maximum   Minimum   IQR   Median   Lower Quartile (Q1)   Upper Quartile (Q3)
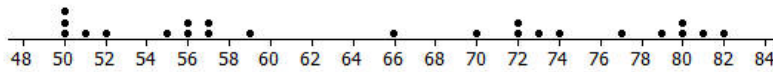
2. Estimate the IQR based on the data set above.

Name _____   Date_____

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 half way between 20 and 10, which would be at 15. And then one more mark belongs half way 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?
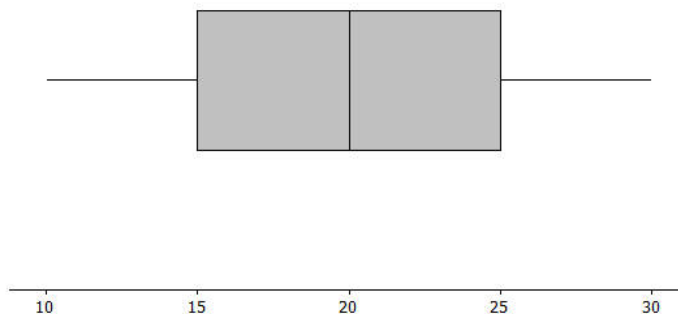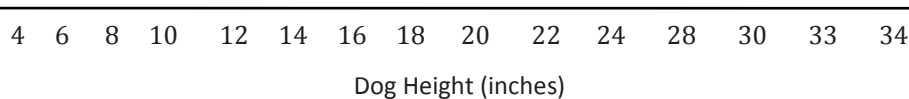
Name _____   Date_____

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.
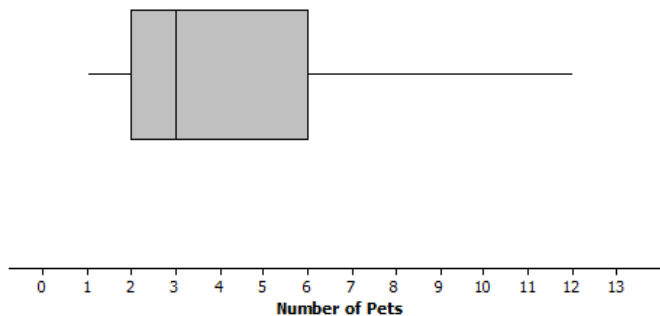
```
     ┌───────────────────────────────────────────────┐
     │                                               │
     └───────────────────────────────────────────────┘
   4   6   8   10    12   14   16   18   20   22   24   28   30   33   34
```

Dog Height (inches)

Name _____   Date_____

Lesson 16: Understanding Box Plots

Exit Ticket

The number of pets per family for students in a sixth grade class is below:

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

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

   a.   Every family had at least one pet.

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

   c.   Most of the families had three pets.

   d.   Half of the families had five or fewer pets.

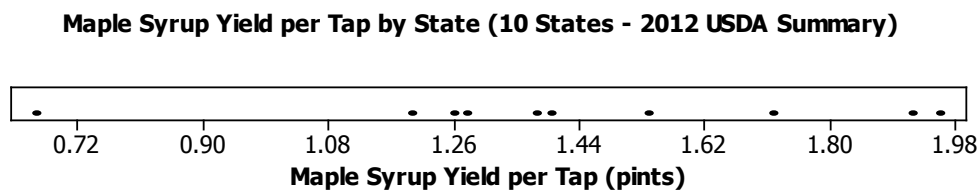   e.   Three fourths of the families had two or more pets.

Name _____   Date_____

Lesson 18: Connecting Graphical Representations and Numerical Summaries

Exit Ticket

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 as listed in the *US Department of Agriculture's 2012 Crop Production Summary*. For the dot plot, which ONE of the three sets of summary measures could match the graph? For each choice that you eliminate, list at least one reason for eliminating the choice.

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

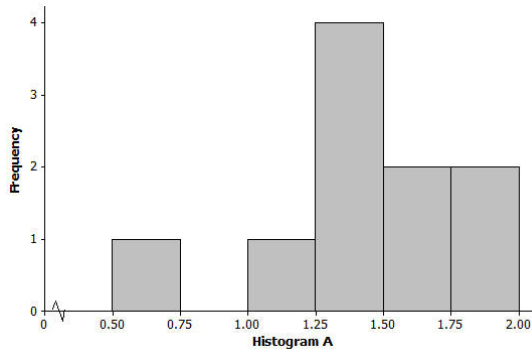| ·			·	··	··	·	·	· ·
0.72	0.90	1.08	1.26	1.44	1.62	1.80	1.98

Maple Syrup Yield per Tap (pints)

(From the *United States Department of Agriculture National Agricultural Statistics Service Crop Production 2012 Summary*, ISSN: 1057-7823, p. 75, accessed May 5, 2013 available at http://usda01.library.cornell.edu/usda/current/CropProdSu/CropProdSu-01-11-2013.pdf.)

   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. For the dot plot in problem 1, which ONE of the three histograms below could be a match? For each choice that you eliminate, list at least one reason for eliminating the choice.
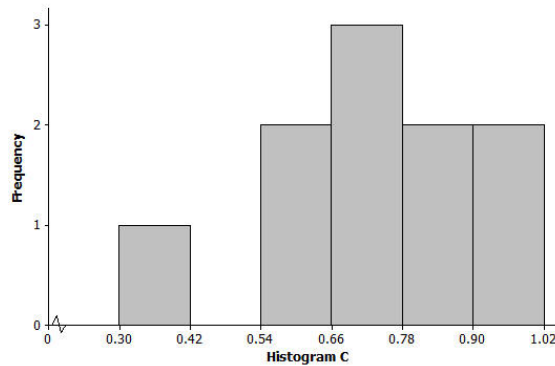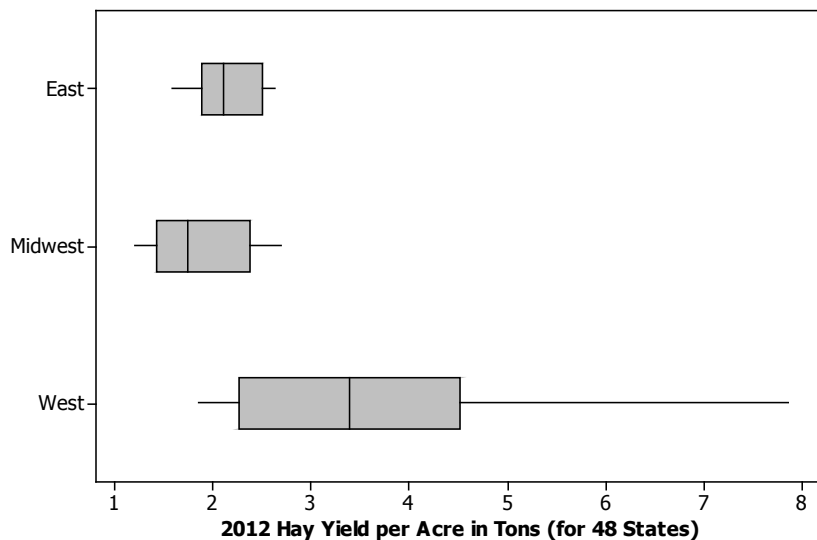
a.

b.
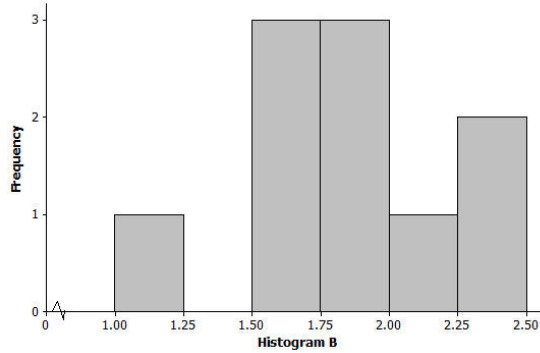
c.

Name _____   Date_____

Lesson 19: Comparing Data Distributions

Exit Ticket

According to the *United States Department of Agriculture National Agricultural Statistics Service Crop Production 2012 Summary*, in the contiguous 48 United States, there was a great deal of variability among states in terms of hay yield per acre. Do some regions of the United States generally have a higher hay yield per acre than other regions? The following box plots show the distribution of hay yield per acre (in tons) for 22 eastern states, 14 mid-western states, and 12 western states in 2012.

(From the *United States Department of Agriculture National Agricultural Statistics Service Crop Production 2012 Summary*, ISSN: 1057-7823, p. 75, accessed May 5, 2013 available at http://usda01.library.cornell.edu/usda/current/CropProdSu/CropProdSu-01-11-2013.pdf.)

2012 Hay Yield per Acre in Tons (for 48 States)

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 (i.e., median, IQR, etc.) or graphical attributes (i.e., shape, variability, etc.) from the three groups.

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 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 graphical attributes from the three groups.

Name _____ Date_____

Lesson 20: Describing Center, Variability, and Shape of a Data Distribution from a Graphic 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 pre-adult fish? Explain your answer.

COMMON CORE

Lesson 20:

Date:

Describing Center, Variability, and Shape of a Data Distribution from a Graphic Representation

10/25/13

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Name _____   Date_____

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

Exit Ticket

Based on your current preparation, summarize the four steps you are expected to complete as part of presenting a statistical study.

The following table could be used for students requiring some structure in calculating the mean absolute deviation, or MAD:

Data Value	Mean	Data Value – Mean	Absolute Value of Data Value – Mean
45			
42			
39			
44			
39			
35			
42			
49			
37			
42			
41			
42			
37			
50			
39			
41			
38			
46			
34			
44			
48			
50			
47			
49			
44			
49			
43			
44			
54			
40			

Template for Lesson 22: Summarizing a Poster

Step 1: What was the statistical question presented on this poster?

Step 2: How was the data collected?

Step 3: What graphs and calculations were used to summarize data?

Summarize at least one graph presented on the poster. (For example, was it a dot plot? What was represented on the scale?) Summarize any appropriate numerical summaries of the data (for example, the mean or the median). Also indicate why these summaries were selected.

Step 4: Summarize the answer to the statistical question.

Name _____ Date _____

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

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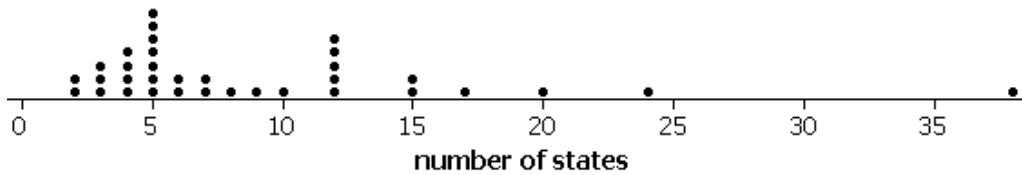
a. How many observations are in this data set?

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:

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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).
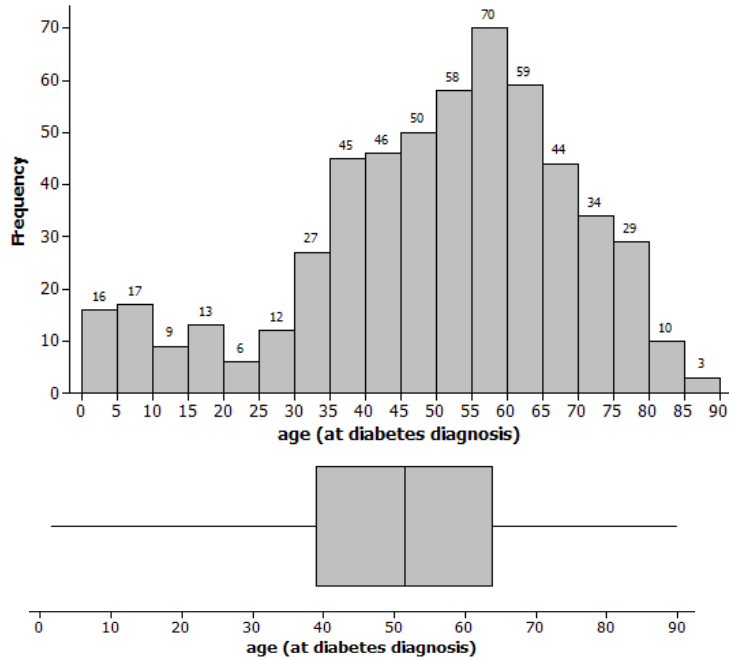
Mean:

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 I diabetes is when the body does not produce insulin. Type I diabetes is usually first found in children and young adults (less than 20 years of age).

- Type II diabetes is when either the body does not produce enough insulin or the cells ignore the insulin. Type II diabetes is usually first found in older adults (50 years of age or older).

a. Explain how the histogram reflects there being these two types of diabetes.

b. The American Diabetes Association says that only about 5% of people with diabetes have type I diabetes. From the graphs, estimate the percentage of these 548 people who found out they had the disease before age 20. Clearly explain how you are doing so and which graph(s) you are using.

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.

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

Planet	Diameter (in miles)
Mercury	3030
Venus	7520
Earth	7926
Mars	4217
Jupiter	88838
Saturn	74896
Uranus	31762
Neptune	30774
Pluto	1428

a. Calculate the 5-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.

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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 9 planets is 27,821 miles with MAD $= 25,552$ miles. Use this information to argue whether or not Pluto is substantially smaller than the remaining eight planets.