

# Warm-Up 4/18/18

Given the following data, find the summary statistics.

4, 8, 11, 3, 7, 7, 10, 10, 9

Mean: 7.7      Q1: 5.5

Median: 8      Q3: 10

Mode: 7, 10      IQR: 4.5

Range: 7      M.A.D.: 2.14



**KEEP  
CALM**

**AND**

**TURN IN YOUR  
HOMEWORK**

**Day 1**

**# 1 - 8c**

Unit 6                      4/18/18

Essential Question

How can we use Dot Plots,  
Histogram, and Box Plots to  
understand the spread of  
data?

## Unit 6: Describing Data

### Standard for Today:

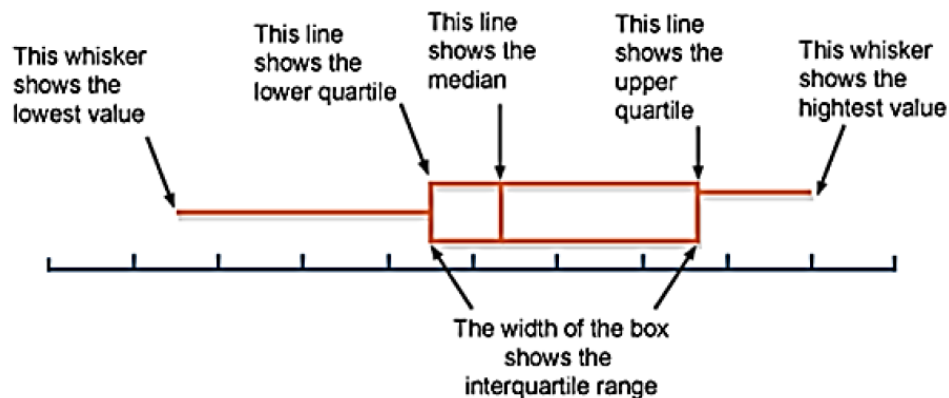
**MGSE9-12.S.ID.1** Represent data with plots on the real number line (dot plots, histograms, and box plots). Choose appropriate graphs to be consistent with numerical data: dot plots, histograms, and box plots.

# Notes 4/18/18

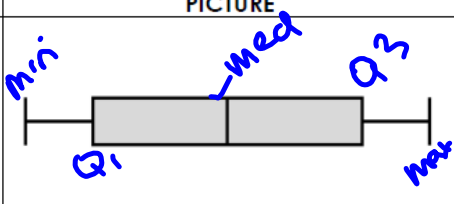
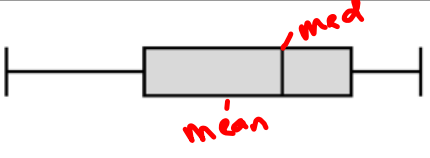
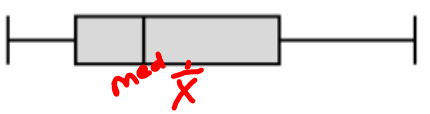
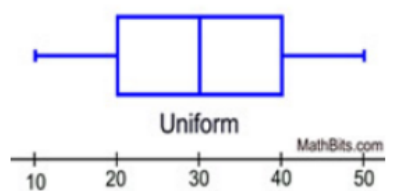
## Day 3 - Box Plots

A **box plot** (also called box and whisker plot) is used to show how data values are distributed. They are created using five important numbers that show the minimum, maximum, median, lower quartile, and upper quartile.

In a box plot, a rectangle is drawn starting at the first quartile and ending at the third quartile. The rectangle shows the middle 50% of the data set. The median is represented by a line. Whiskers are drawn from the rectangle to the minimum and maximum data values. An example of a box plot is below:



Types of Box Plot Distributions

TYPE	DESCRIPTION	PICTURE
<b>SYMMETRIC</b>	When graphed, a vertical line drawn at the center will form mirror images.  This shape is referred to as the bell shaped curve or normal curve.  The median and mean will be approximately equal.	
<b>SKEWED LEFT</b> (NEGATIVE SKEW)	Fewer data points are found to the left of the graph. The "tail" of the graph is to the left.  The interquartile range will be shifted to the right of the number line (inside IQR) and the <u>mean less than the median</u> .	
<b>SKEWED RIGHT</b> (POSITIVE SKEW)	Fewer data points are found to the right of the graph. The "tail" of the graph is to the right.  The interquartile range will be shifted to the left of the number line and the mean greater than the median.	
<b>UNIFORM</b>	<u>The data is spread equally (or very close to equally) across the range.</u>  Uniform distributions are a type of symmetric distributions.  The median and mean will be approximately equal.	

**Outliers:** A data value that lies on the outside of all the other data values. It is denoted by an asterisk (\*) or dot.

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### Identifying Distributions

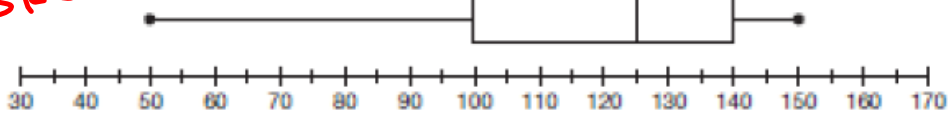
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Identify the type of distribution of the following box plots.

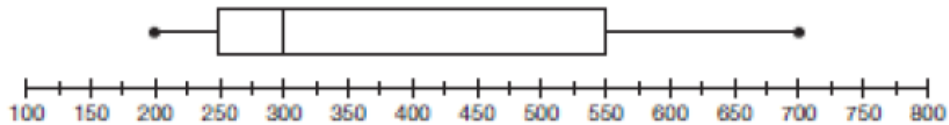
a.

*Skewed left*



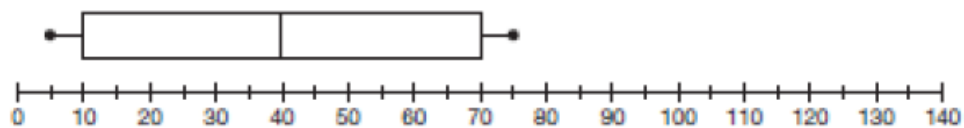
b.

*Skewed right*



c.

*Symmetric*



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**Calculating the Parts of a Box Plot**

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Before you can even create a box plot, you have to know how to calculate the "five number summary", which consists of the minimum, maximum, median, lower quartile, and upper quartile.

Using the following data set, find the five number summary:

{15, 10, 12, 18, 10, 22, 11, 17, 13}

10, 10, 11, 12, 13, 15, 17, 18, 22

**Minimum:** Smallest number of the data set 10

**Maximum:** Largest number of the data set 22

**Median:** Middle number of the data set 13

**Lower Quartile:** Median of the lower half of the data set (Q1 or First Quartile)

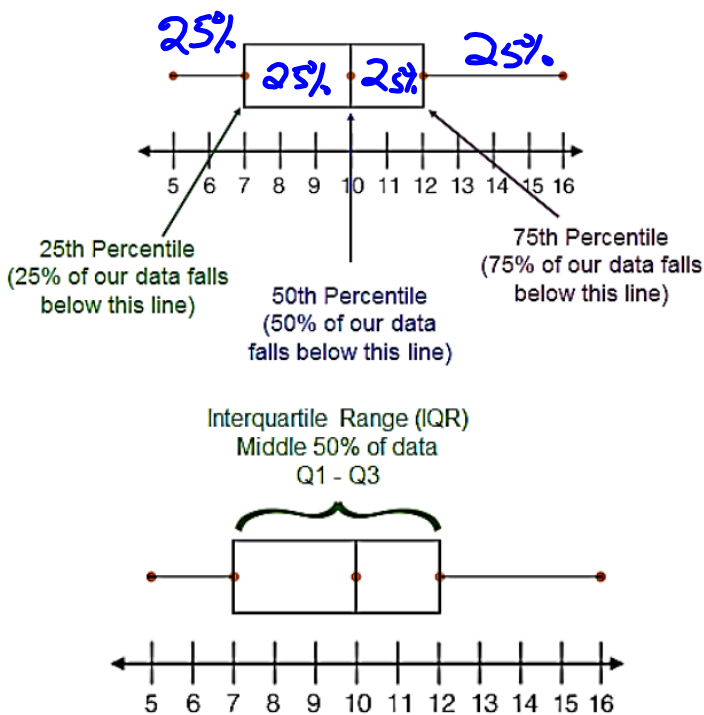
10.5

**Upper Quartile:** Median of the upper half of the data set (Q3 or Third Quartile)

17.5



Interpreting Box Plots



List the data values that fall below 25%:

5, 6

List the data values that fall above 75%:

13, 14, 15, 16

List the data values that fall above 50%:

11, 12, 13, 14, 15, 16,

Calculate the IQR:  $Q_3 - Q_1$   
 $12 - 7 = 5$

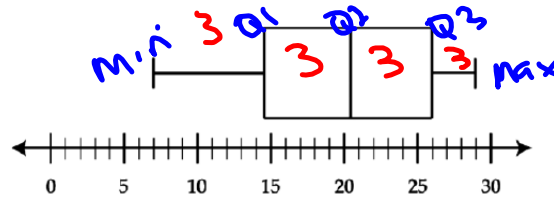
**\* Calculating the Outlier:**

**$Outlier < Q_1 - 1.5(IQR)$  OR  $Q_3 + 1.5(IQR) < Outlier$**

Practice with Box Plots

**Example 1:** Analyze the box plot below about the cost, in dollars, of 12 CD's. Answer the questions.

$Q3 = 26$   
 $Q1 = 14.5$



A. Which cost is the upper quartile?

26

B. What is the range?

$29 - 7 = 22$

C. What is the median?

21

D. Which cost represents the 100<sup>th</sup> percentile?

29

E. How many CD's cost between \$14.50 and \$26.00?

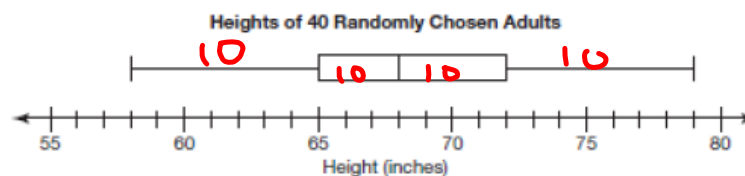
$3 + 3 = 6$

F. How many CD's cost less than \$14.50?

3

Example 2: Analyze the box plot below and answer the following questions:

Min = 58  
 max = 79  
 median = 68  
 Q1 = 65  
 Q3 = 72



A. What is the height range of the middle 50 percent of the surveyed adults?

$$72 - 65 = 7 \text{ inch}$$

B. How many of the surveyed adults are between 72 and 79 inches?

10 adults.

C. What percent of the surveyed adults are 72 inches or shorter?

75%

D. What is the height of the tallest adult surveyed?

79 inches

E. About 10 people have a height below what amount?

65 inches.

F. About 20 people have a height above amount?

68 inches

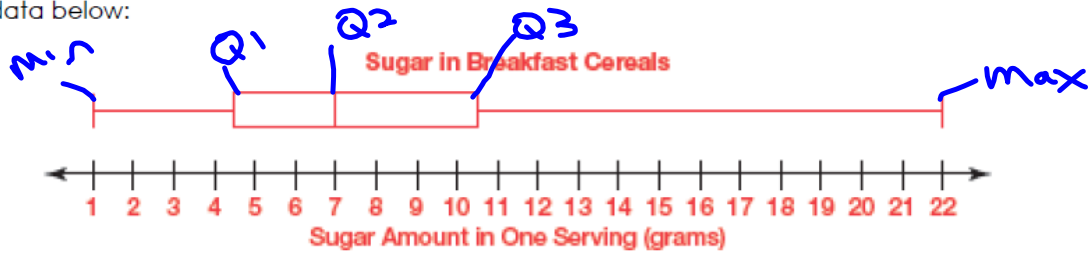
G. How many of the surveyed adults are at least 58 inches tall?

40

H. Describe the distribution. Is the median or mean best describe the data?

Uniform distribution  
 either mean or median can best describe the data.

**Example 3:** Jamie has organized the amount of sugar, per serving, in many different cereals and created a box plot of his data below:



a. State the numbers (including what they represent) for the five number summary.

Min = 1 gram of sugar in breakfast cereal.  
 Q1 = 4.5 grams of sugar  
 Med = 7 grams of —  
 Q3 = 10.5 g.  
 max = 22 g.

b. Give three conclusions that can be made about the sugar amount in one serving of breakfast cereal.

c. Describe the distribution and interpret the meaning of the distribution in terms of this problem situation.

d. Jamie says that more breakfast cereals have over 10 grams of sugar per serving than have under 5 grams of sugar per serving because the whisker connecting Q3 to the maximum is longer than the whisker connecting Q1 to the minimum. Is he correct? Explain why or why not.

## Home Work - 4/18/18

1. Day 2: Dot Plots &  
Histograms # 2 & 4 Due  
tomorrow - Thursday

2. Day 3: Box Plots  
#s 1 - 3 Due Thursday  
4/19/18



# Class Work 4/18/18

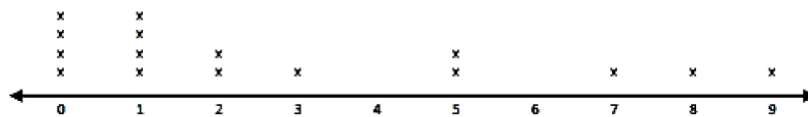
Day 2: Dot Plots and Histograms

Name: \_\_\_\_\_

Practice Assignment

Block: \_\_\_\_\_

1. Analyze the given dot plot which displays the number of home runs by each member of the Atlanta Braves team this season so far and answer the questions accordingly.



a. Describe the distribution of the data. Is the data skewed left or right? What does this mean in terms of the problem? *Skewed right, 2 or less h.r on the right side.*

b. How many players are on the team?

*16*

c. How many players hit more than 2 home runs?

*6*

d. How many players hit at least 1 home run?

*12*

e. How many players scored more than 1 and fewer than 9 home runs?

*7*

3. The histogram shows the amount of money in dollars that people donated to a fund to help save the whales.

a. How many people donated between \$50 and \$59?

5

b. For which interval did the most people donate money to the fund?

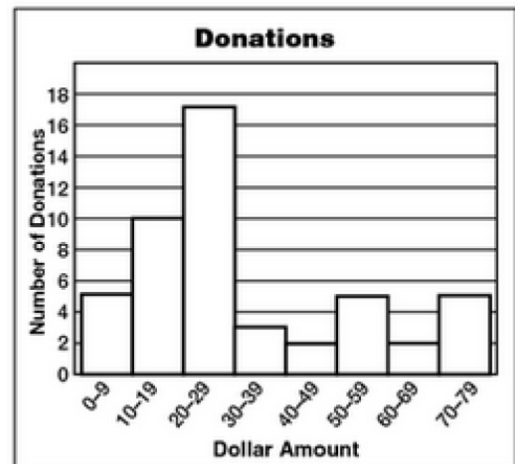
20-29

c. How many people donated \$50 or more to the fund?

12

d. Is the data skewed left, skewed right, or symmetric? Explain what this means in context of the problem.

Skewed right



e. At about what value would the median fall?

20-29

# Day 3: Box Plots # 4

4. The accompanying box-and-whisker plots can be used to compare the annual incomes of three professions. Based on the box-and-whisker plots, determine if each statement is true or false.

a. The median income for nuclear engineers is greater than the income of all musicians.

False

b. The median income for police officers and musicians is the same.

True

c. Nuclear engineers have the largest interquartile range of incomes among the three professions.

False

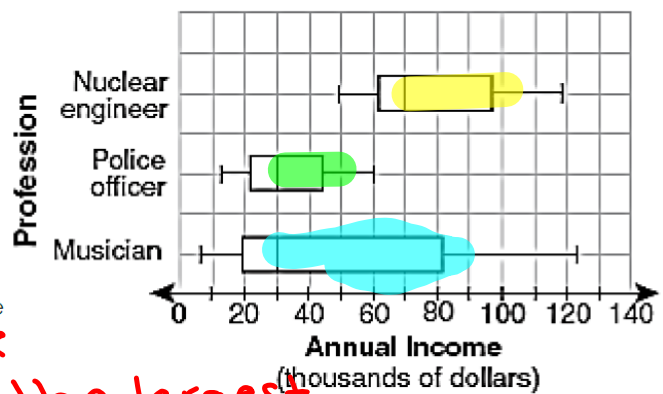
Musicians have the largest

d. All nuclear engineers earn more than all police officers.

False

e. Police officers have the less variability (difference in spread) in earnings.

True





f. 25% of musicians make \$20,000 or less.

True

g. There are more data values for musicians between the median and Q3 than between Q1 and the median.

False - the lower 25% for engineers overlaps the upper 25% for police officers.

h. 50% of musicians make between \$20,000 and \$81,000.

True

i. 50% of nuclear engineers make between \$50,000 and \$70,000.

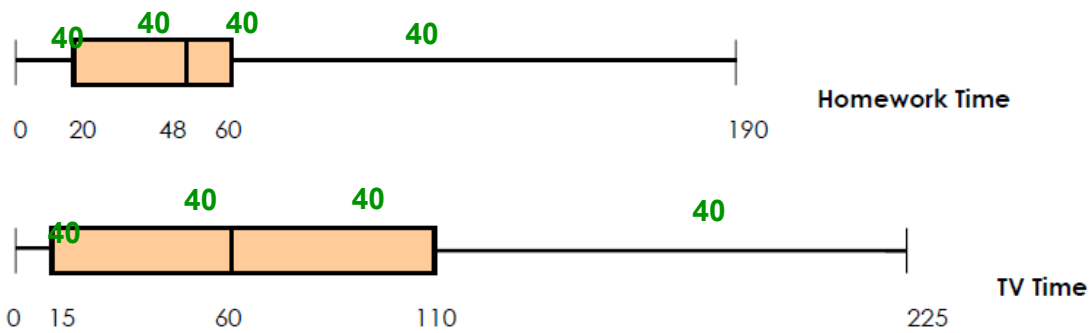
True

j. Nuclear engineers have the largest range of incomes.

False

**TV & Homework Minutes per Night**

The box plot represents 160 freshmen and how much time they spend on homework and watching TV.



- 75% 1. What percent of the freshmen watch TV for at least 15 minutes per night?
- 110 min 2. What is the 3<sup>rd</sup> quartile for the TV time data?
- 120 3. How many freshmen spend 60 minutes or less working on homework?
- 40 4. How many freshmen spend at least 110 minutes watching TV?
- 50% 5. What percent of freshmen completed between 20 and 60 minutes of homework?
- 50% 6. What percent of freshmen watched 60 to 225 minutes of TV a night?
- No 7. Are there any outliers?

For questions 8 – 13, identify if each statement is true, false, or cannot be determined.

- True 8. Some freshmen didn't watch TV that month.
- CBD 9. 15% of freshmen did not watch any TV.
- True 10. 25% of the freshmen spend between 48 & 60 minutes per night on homework.
- False 11. 75% of the freshmen spend at least 60 minutes watching TV.
- True 12. In general, these freshmen spend more time watching TV than doing homework.
- False 13. The homework box plot is skewed left.

14. Is it more common for a freshman at this high school to spend more than 1 hour on homework or more than 1 hour watching TV? Explain. **Watching TV because 50% of them spend at least an hour watching TV whereas 25% spend at least an hour doing HW.**

15. How would you describe both distributions? Explain why.  
**Both are skewed right because the "tail" is longer on the right.**

## Student-Led Closing: 4/18/18

Write down the different parts of a box plot and describe what those different parts tell us about a data set.