

# *1 Variable Stats:*

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

## **Goals:**

**Target A:** I can calculate the measures of center (mean, median and mode) for a given data set.

**Target B:** I can calculate the measures of spread (range, IQR, standard deviation, mean deviation and variance) for a given data set.

**Target C:** I can create and use data displays (histograms, dot plots, box and whiskers) to make determinations about data sets.

**Target D:** I can apply statistical measures (mean, median, mean deviation, variance and standard deviation) to make determinations about data sets.

## **Resources:**

*[mrnohner.com/onevar.html](http://mrnohner.com/onevar.html)*

## One Variable Statistics Vocabulary:

The \_\_\_\_\_ is the most commonly occurring data point. There can be more than one of them for a data set.

If you lined up all the data from least to greatest, the \_\_\_\_\_ would be the middle number.

If you take the sum of the data and divide by the number of data points you were given you would have the \_\_\_\_\_. This is commonly also called the “average.”

25% of the data falls below the \_\_\_\_\_ and 75% of the data is above.

75% of the data falls below the \_\_\_\_\_ and 25% of the data is above.

The difference between the largest piece of data and the smallest is called the \_\_\_\_\_.

The difference between the first quartile and the third quartile is called the \_\_\_\_\_.

The \_\_\_\_\_ of the data is determined by outliers.

A \_\_\_\_\_ is a diagram consisting of rectangles whose height represents how many data points you have and the width is determined by the bin size you have selected.

A \_\_\_\_\_ is a statistical chart consisting of data points plotted on a fairly simple scale, typically using filled in circles.

A \_\_\_\_\_ is a graphic way to display the median, quartiles, and extremes of a data set on a number line to show the distribution of the data.

Guide notes

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| Title:   | Date: |
| Goal:    |       |
| Notes:   |       |
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# Dice Golf

- 1) My group members are:
- 2) Their favorite ice cream is:
- 3) Record your team's data here:

| Name | Toss 1 | Toss 2 | Toss 3 | Toss 4 | Toss 5 |
|------|--------|--------|--------|--------|--------|
|      |        |        |        |        |        |
|      |        |        |        |        |        |
|      |        |        |        |        |        |

- 4) What is the range, median and mean of the data?
- 5) Did you group of outliers? What caused them?
- 6) What result did the outliers have on the skew of the data?
- 7) What is a better measure of the center of the data: mode, mean or median? Why?
- 8) Would the mean or the median be affected more if one member of your team accidentally tossed the dice past the cup and it went into the hallway

The Tigers, Knights and Warriors are basketball teams. These are the amounts of points they have scored in the last 5 games.

|                 | Game 1 | Game 2 | Game 3 | Game 4 | Game 5 |
|-----------------|--------|--------|--------|--------|--------|
| <b>Tigers</b>   | 54     | 68     | 71     | 42     | 80     |
| <b>Knights</b>  | 77     | 41     | 93     | 52     | 69     |
| <b>Warriors</b> | 61     | 78     | 75     | 59     | 63     |

9) Why is the median for the knights not 93 points?

10) Find the median and mean for each team.

11) What is more useful in your opinion for determining the best team? Using your logic who is the best team?

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12) The Hookenslise Corporation is in the midst of union negotiations. Labor claims that the company's average salary is \$28,000 while management claims it is \$32,000. If they are using the same set of data, how can their averages be different? How could such a large difference have occurred?

13) Create a set of data where the mean is:

- a) Far larger than the median
- b) Far smaller than the median
- c) The same as the median

## Box Plots

Two classes have the following pre-test scores:

2nd period: 49, 52, 54, 58, 61, 61, 67, 68, 72, 73, 73, 73, 78, 82, 83

4th period: 29, 35, 48, 57, 58, 65, 68, 73, 74, 85, 86, 87, 91, 94, 100

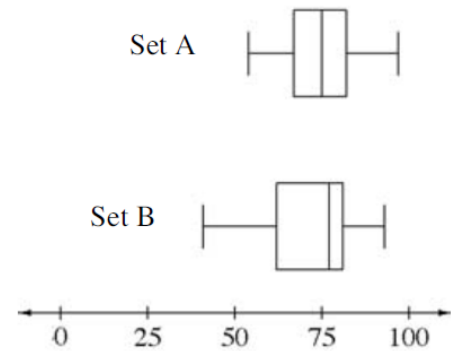
1) Create parallel box and whisker plots for each class. Include a number line for scale.

2) Does either class have outliers?

3) Would the median or mean be more affected by someone scoring a 0 on the pretest?

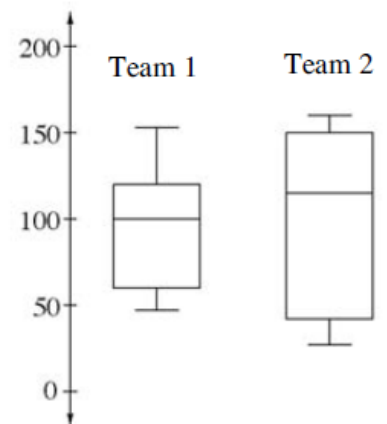
5)

Compare the two data sets in the parallel box plot at right. Compare the center, shape, and spread of the data sets. Write a possible scenario for the data.



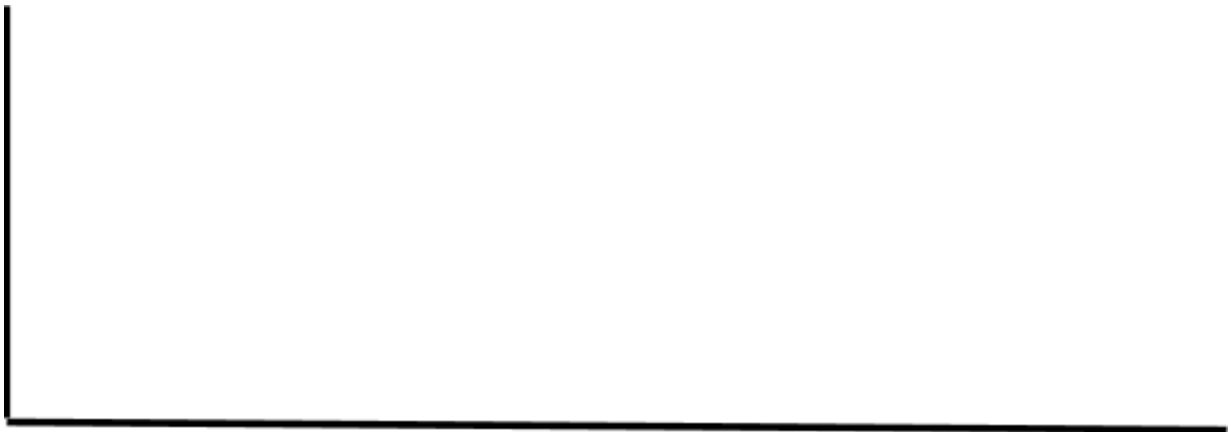
6)

The manager of Widgets R Us has two teams of employees and wants to know which team is working the “best.” The assistant manager gathered data for the average number of widgets made per team member per shift and presented it to the manager in the form of a parallel box plot, shown at right. The manager is confused. Help them decide which team is working the “best.”



## Histograms and Dot Plots:

- 1) How do you know when to use a dot plot or a histogram to display data?
  - a) Describe a set of data that work better with a histogram
  - b) Describe a set of data that would be better with a dot plot.
- 2) For each problem, determine if a histogram or dot plot would be better. Then describe the skew, center and spread of the data. Remember: Left skew means the tale is longer on the left side, right skew means the tail is longer on the right side. Center refers to the mean, median and mode. Spread refers to the standard deviation and interquartile range.
  - a) The number of hours an iPhone stays charged.  
9, 10, 15, 8, 7, 8, 11, 19, 8, 10

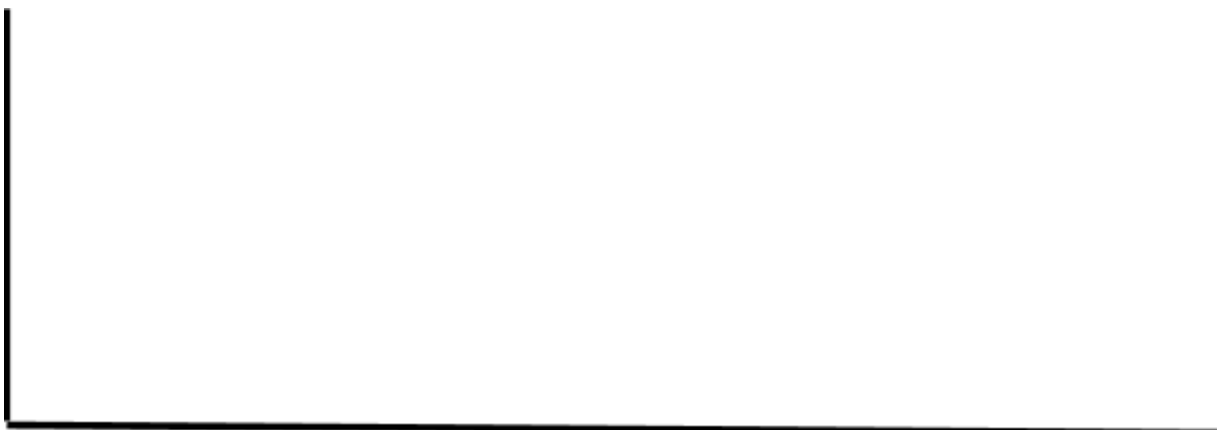


Skew:

Center (Median, Mean):

Spread (Range):

- b) The numbers of courses a student at Wilson takes.  
7, 8, 8, 6, 7, 8, 7, 4, 8, 3

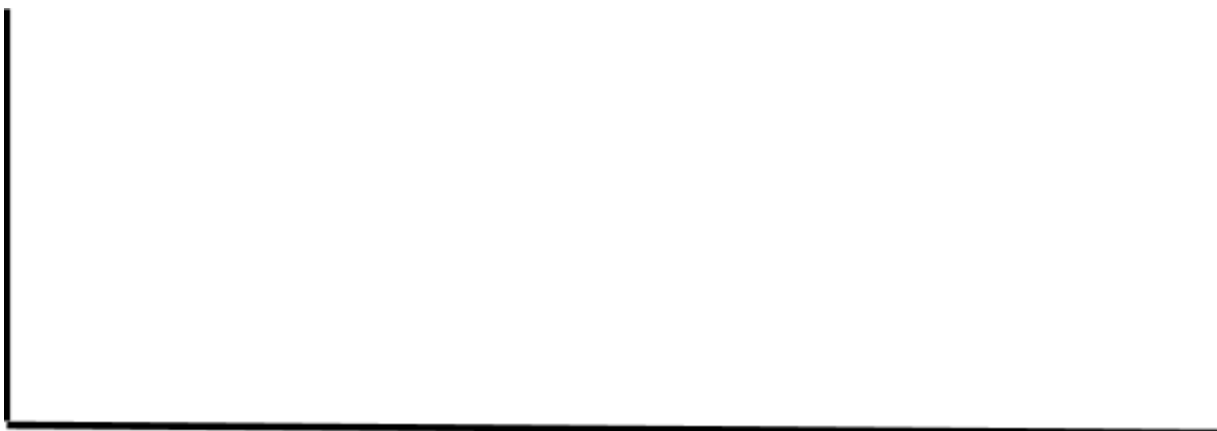


Skew:

Center:

Spread:

- c) The number of pages in children's books. (Use a bin size of 10)  
17, 22, 26, 24, 31, 33, 37, 26, 22, 27, 24, 56



Skew:

Center:

Spread:

Name: \_\_\_\_\_ Pd: \_\_\_\_\_ Date: \_\_\_\_\_  
Mean Deviation, Variance, Standard Deviation

10 , 12, 14, 16, 18, 20

1) Find the Mean Deviation:

2) Find the Variance:

3) Find the Standard Deviation:

100 , 102, 104, 106, 108, 110

4) Find the Mean Deviation:

5) Find the Variance:

6) Find the Standard Deviation:



7) Why were the answers to 1,2,3 the same as 4,5,6?

8) Consider two pitchers runs allowed per game:

|            |             |           |         |                     |
|------------|-------------|-----------|---------|---------------------|
| a) Alex:   | Median: 3   | Mean: 3.2 | Mode: 4 | Mean Deviation: 0.7 |
| b) Carlos: | Median: 2.7 | Mean: 3.4 | Mode: 3 | Mean Deviation: 1.9 |

Who is the more consistent pitcher? Why?

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

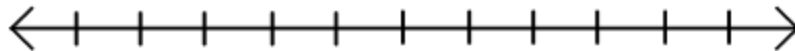
1 Variable Stats Practice Test

- 1) Make a dot plot with the following data gathered about how many text messages a student sent in 2nd period. They asked 26 students and here are the results. Make sure to include units and proper scaling.

Data: 4, 5, 10, 2, 3, 2, 6, 7, 7, 3, 2, 5, 8, 5, 4, 3, 4, 3, 2, 1, 2, 3, 4, 5, 7, 9

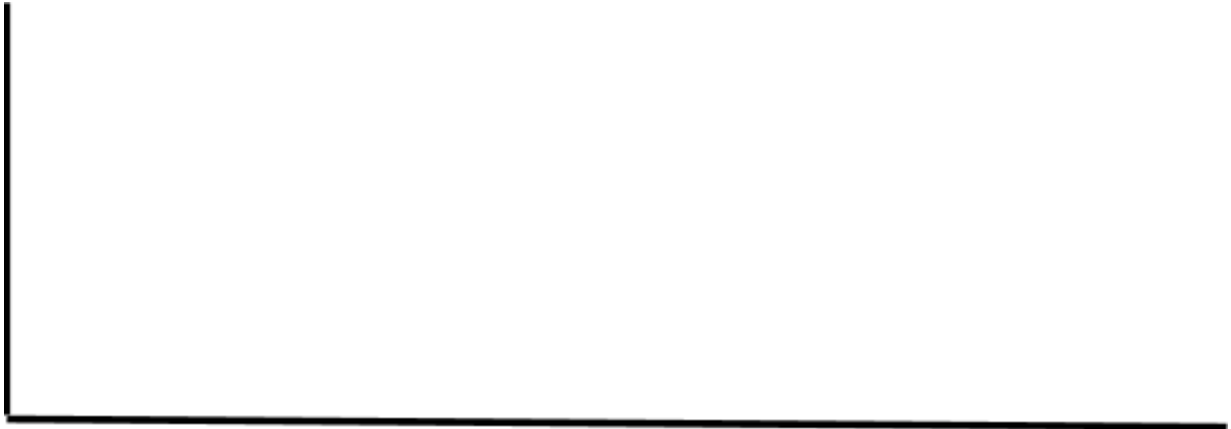


- 2) Make a box and whisker with the same data. Make sure to use a number line below for scale.



3) The following data is the average number of hours students at Wilson High School slept according to an app that tracks when you actually fall asleep and wake up. Make a histogram with the following data. Have a bin size of 1 and cover the range of 5 to 10.

Data: 6.2, 7.1, 8.3, 9.5, 5.2, 6.7, 9.1, 5.7, 6.7, 7.4, 8.4, 6.8, 8.3, 8.6, 7.5, 7.2, 8.9, 6.4, 8.6, 7.2



4) Find the following information given the data of student shoe sizes:

6, 6.5, 6.5, 7, 7, 7, 7.5, 8, 8, 8, 8, 8.5, 9, 9, 10, 10.5, 11, 11.5, 12, 12.

Minimum:

Max:

Range:

Q1:

Q3:

Interquartile Range:

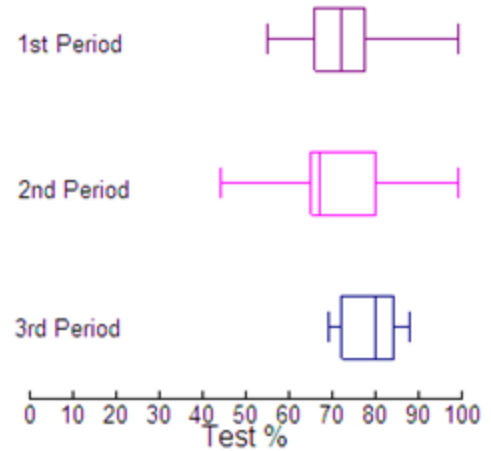
Median:

Mode:

Mean:

5) One student will be chosen from one of Mrs. Mosby's classes to compete in the upcoming Algebra Contest. Test results (in percentages) for three of Mrs. Mosby's Algebra 1 classes are shown to the right.

### Mrs. Mosby's Algebra 1 Class



From which period would you recommend a student be chosen (at random) to represent the school in the upcoming Algebra Contest if...

- A. You wanted the best chance at winning the contest.

Justify your answer.

- B. You wanted the best chance at not coming in dead last. Justify your answer.

6) Every single month I keep track of how many donuts I have eaten. Here is that data.  
5, 7, 10, 11, 13, 14, 9, 8, 11, 12, 11.

Next month my brother Joe is coming in town and I will be eating a minimum of 90 donuts (Relax, that's only 3 a day....).

What measure of center is affected the most? (Mean, Median , Mode) Why?

7) Find the mean deviation of the following data: 4, 15, 14, 16, 0, 30, 26

8) Find the variance of the following data: 4, 15, 14, 16, 0, 30, 26

9) Find the standard deviation of the following data: 4, 15, 14, 16, 0, 30, 26

10) I want to run an average (mean) of 4 miles a day. If I run 5 on Monday, 7 on Tuesday, 0 on Wednesday, 0 on Thursday, 0 on Friday, 0 on Saturday, then how many would I have to run on Sunday to keep that 4 miles per day average (mean)?

### Challenge Problems:

- 1) Imagine you are on the soccer team. Your coach keeps track of your practice shots during two practice sessions.

First practice...

You score 2 out of 10 shots.  
Sam scores 3 out of 10 shots.

Who's better?

Second Practice...

You score 53 out of 100 shots.  
Sam scores 6 out of 10 shots.

Who's better?

Now combine the data from the two practices and re-evaluate.

Who's better? Why?

- 2) Noah scored 88%, 92%, 85%, 65% and 89% on 5 tests in history class. The teacher normally uses the mean to calculate the overall score. Why might you argue to use the median instead?

- 3) Create a set data that fits each description.

- a. The mean age of a family is 19 years, and the median age is 12 years. There are five people in the family.
- b. Six students in the Mathematics Club compared their family sizes. The mode was 5 people and median was four people.
- c. The points scored by the varsity football team in the last seven games have a mean score of 20, a median of 21 and a mode of 27.

4) Sketch what you think a histogram looks like for each situation below. Remember to label values and units on the axes.

- a. The outcomes when rolling a die 100 times.
- b. The estimates of the height of the classroom ceiling made by 100 different students.
- c. The ages of the next 100 people you meet the school hallway.

5) Housing prices in Portland are a concern right now. Do you think the mean or median house price is a better indicator of the housing market? Explain.

6) A computer chip manufacturer has a quality control department. The company needs the microchips to 8 micrometers thick. Look at the following data for two workers.

|          |     |     |     |     |            |              |
|----------|-----|-----|-----|-----|------------|--------------|
| Worker A | 7.9 | 8.0 | 8.2 | 8.3 | Mean:_____ | Median:_____ |
|----------|-----|-----|-----|-----|------------|--------------|

|          |   |   |    |    |            |              |
|----------|---|---|----|----|------------|--------------|
| Worker B | 2 | 4 | 12 | 14 | Mean:_____ | Median:_____ |
|----------|---|---|----|----|------------|--------------|

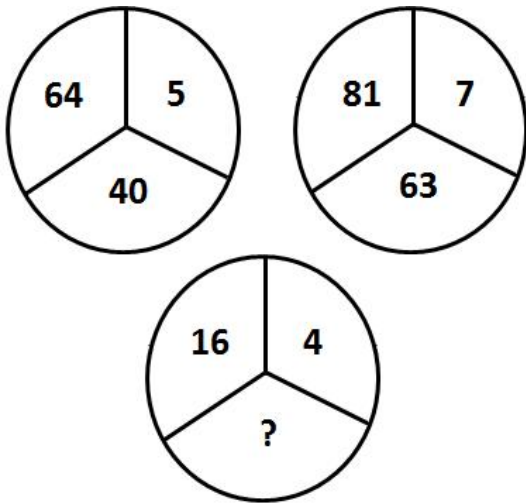
- a) Which worker had the better average?
- b) Which worker would you prefer to purchase a microchip from?
- c) How would you defend your decision?

## 7) The Golden Ratio

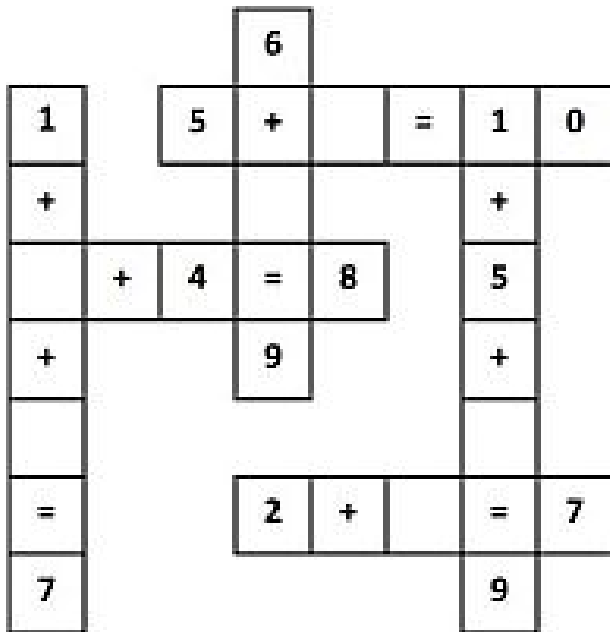
- a) Do a quick search for basic information about the Golden Ratio. What is it? What is it a ratio comparing? Can you draw a picture representing the golden ratio?
  
  
  
  
  
  
  
  
  
  
- b) Write down a little history of the golden ratio. Who named it?
  
  
  
  
  
  
  
  
  
  
- c) Where do we find the Golden Ratio in nature?
  
  
  
  
  
  
  
  
  
  
- d) What are some applications of the Golden Ratio?
  
  
  
  
  
  
  
  
  
  
- e) How does it connect to the Fibonacci sequence(What's the Fibonacci sequence)?



8) What number is missing?



9) Fill in the blanks.



10) Solve.

$$9 - 3 \div \frac{1}{3} + 1 =$$

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## Answer Key:

### Dice Golf:

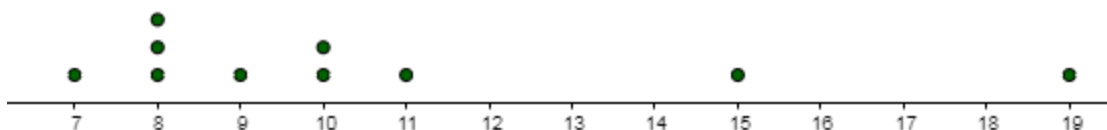
1-5) Answers will vary 6) Outliers will affect the mean far more than the median 7) Answers will vary 8) Mean would be affected more. 9) 93 is the middle now, but the data is not sorted, once you sort it the median is 69. 10) Tiger's Median: 68 Tiger's Mean: 63 Knight's Median: 69 Knight's Mean: 66.4 Warriors Median: 63 Warriors Mean: 67.2 11) Answers may vary, make sure to use comparisons, data and vocab. 12) One is using the median and one is using the mode. Potentially outliers could be lifting the mean higher, while leaving the median relatively lower. 13) Answers vary

### Box Plots:

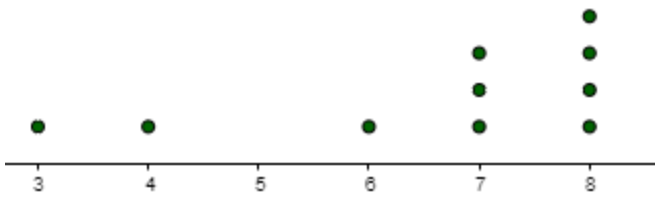
- 1) The box plots will have the following measures  
2nd period: Minimum: 49, Q1: 58, Median: 68, Q3: 73, Max: 83.  
4th period: Minimum: 29, Q1: 57, Median: 73, Q3: 87, Max: 100.
- 2) Period 2 has no outliers, period 4 has outliers of 29 and 35 as the biggest outliers in the data.
- 3) The median is more resistant to outliers, the mean would be more affected by a student scoring a 0 on the pretest.
- 4) Answers will vary.
- 5) Answers will vary. Make sure you make a comparison, include numbers, and vocabulary in your answer.

### Histograms and Dot Plots:

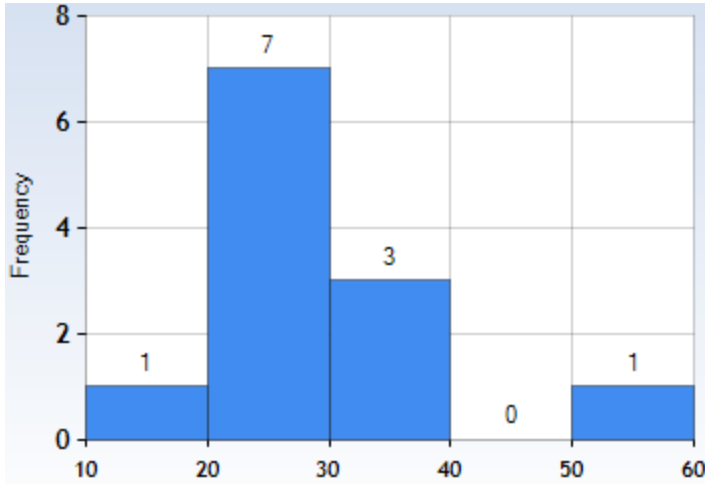
- 1) Histogram: Any data with a big spread or data that has decimal values.  
Dot Plot: Data with whole numbers with limited range of values.



- 2)  
Skew: right                      Center: Median 9.5      Mean 10.5                      Spread: Range 12



3)  
 Skew: left                      Center: Median 7      Mean 6.6                      Spread: Range 5

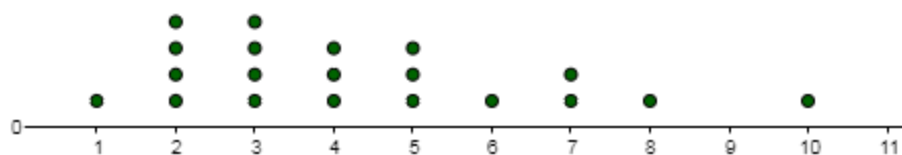


4)  
 Skew: right                      Center: Median 26      Mean 28.75                      Spread: Range 39

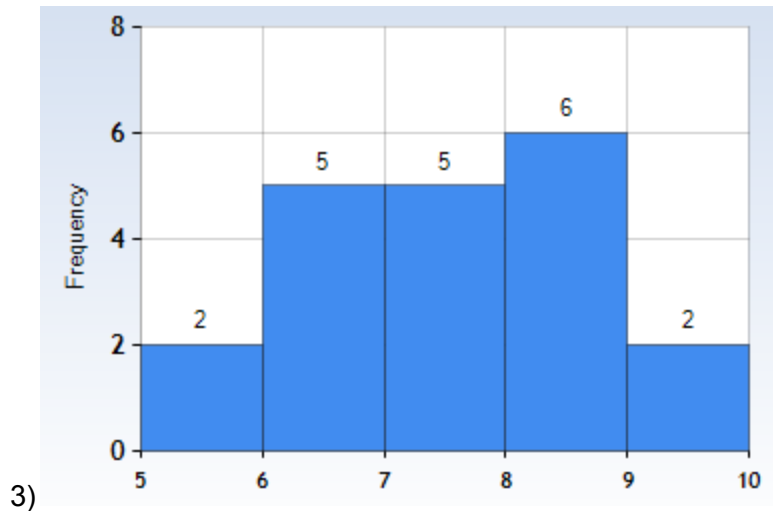
### Mean Deviation, Variance, Standard Deviation:

- 1) 3.6    2) 14    3) 3.74    4) 3.6    5) 14    6) 3.74    7) Because those three measures all measure how the data is spread out and both data sets are equally spread.    8) Alex is the more consistent pitcher because he has the smaller mean deviation.

### Practice Test:



- 1)
- 2) The box plots will have the following measures  
 Minimum: 1, Q1: 3, Median: 5, Q3: 5, Max: 10.



4) Minimum: 6      Max: 12      Range: 6      Q1: 7      Q3: 10.25  
 Interquartile Range: 3.25      Median: 8      Mode: 8      Mean: 8.65

5) Answers will vary. Make sure you make a comparison, include numbers, and vocabulary in your answer.

6) The mean will be the most affected, the median is outlier resistant because when you find it your first step is to remove each of the most extreme values.

- 7) 7.7
- 8) 99.1
- 9) 9.95
- 10) 16

Now the commencement speakers will typically also wish you good luck and extend good wishes to you. I will not do that, and I'll tell you why. From time to time in the years to come, I hope you will be treated unfairly, so that you will come to know the value of justice. I hope that you will suffer betrayal because that will teach you the importance of loyalty. Sorry to say, but I hope you will be lonely from time to time so that you don't take friends for granted. I wish you bad luck, again, from time to time so that you will be conscious of the role of chance in life and understand that your success is not completely deserved and that the failure of others is not completely deserved either. And when you lose, as you will from time to time, I hope every now and then, your opponent will gloat over your failure. It is a way for you to understand the importance of sportsmanship. I hope you'll be ignored so you know the importance of listening to others, and I hope you will have just enough pain to learn compassion. Whether I wish these things or not, they're going to happen. And whether you benefit from them or not will depend upon your ability to see the message in your misfortunes.

Supreme Court Justice John Roberts

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Life is not easy for any of us. But what of that? We must have perseverance and above all confidence in ourselves. We must believe that we are gifted for something and that this thing must be attained.

Marie Curie

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The roots of education are bitter, but the fruit is sweet

Aristotle