Getting Ready for Statistics

1. Rounding
2. Fractions, Decimals, and Percentages
3. Summary Statistics – Center and Spread
4. Graphing Data: Dot Plots and Stem-and-Leaf Plots
5. Graphing Data: Box and Whisker Plots
6. Using the TI-84 Calculator

Rounding

There are no specific rules for Statistics. Generally, you round appropriately for the given situation. If you don't round enough, your numbers will be hard to interpret and if you round too much you sacrifice the accuracy of your information. Best practice is to follow the standard rounding rules: that is half-round up. Just remember: 5 and above round up, 4 and below round down!

Round the following:

Ex 1 - 29.4319 to the nearest hundredth

We round down based on the 1 so the final answer is **29.43**

Ex 2 - 0.037292319586

In Statistics, we usually round to 2, 3, or 4 decimal places, depending on the situation. You should round at least to the nearest hundredth (.04) but you can do to the nearest thousandth (.037) or ten-thousandth (.0373).

Round the following.

1. 12.842 to the nearest tenth

2. 0.4892745 to the nearest hundredth

3. 0.0342119 to the nearest thousandth

4. 0.06049822 to the nearest ten thousandth

5. 25.6895234

6. 0.033231532

7. 0.00279625

8. 0.63636363

Fraction, Decimals, and Percentages

Statistics works with a lot of proportions which can be expressed as fractions, decimals, or percentages.

Ex 1 – Convert $\frac{11}{14}$ to a decimal

Dividing gives **0.7857**.

Ex 2 - Convert 35% to a decimal

Moving the decimal place gives **0.35**

Ex 3 - Convert 0.02 to a percentage

Moving the decimal place gives **2.0%**

Ex 4 - Convert $\frac{5}{12}$ to a percentage

Dividing and moving the decimal place gives **41.67%**

Ex 5 – Find 3.9% of 749

0.039(749) = **29.211**

Convert the following:

1. $\frac{13}{3}$ to a decimal
2. $\frac{41}{563}$ to a decimal
3. 8% to a decimal
4. 22.45% as a decimal
5. 100% as a decimal
6. 0.672 to a percentage
7. 0.0052 to a percentage
8. $\frac{4}{25}$ to a percentage
9. $\frac{11}{285}$ to a percentage

Solve the following:

10. What is 17.2% of 89?

11. What is 3% of 446?

12. What percentage is 45 of 82?

13. What percentage is 23 of 65.2?

Summary Statistics – Center and Spread

A statistic is a number that gives information about a set of data. Common examples include mean, median, mode, range, and standard deviation. For populations, Greek letters are used and for samples, English letters are used. For example, the population mean is represented by μ and the sample mean is represented by $\bar{x}$.

Measures of center are the "typical" or "average" value of a number in a data set. The two primary measures of center are mean and median. The mean is found by the sum of the data points divided by the number of data points. The median is the middle number of the data set if the numbers are arranged in order. If there are an even number of data points, find the average of the middle two numbers.

Measures of spread tell us whether the data points are far apart or clustered together. The most important measure of spread is standard deviation (σ), which is the typical distance of the data points from the mean. Other measures of spread are range and IQR.

Find the following:

1. Find the mean and median of the following data set.

   Teaching experience (in years) of all teachers at a certain school

   1, 3, 3, 3, 4, 4, 5, 5, 5, 6, 7, 7, 18, 23, 26

2. Find the mean and median of the following data set.

   Weights (in pounds) of 8 randomly selected chickens on a farm

   5.4, 9.0, 6.2, 7.2, 5.7, 6.8, 7.2, 8.1

3. Find the mean and median of the following data set.

   Temperature readings (in degrees Fahrenheit) on all the thermostats in an office building

   71, 74, 72, 69, 72, 76, 72, 74, 68, 71

4. List the following data sets in order from *least spread* to *most spread out*. Explain your reasoning.

   Teachers: $\sigma = 7.02$
   Chickens: $\sigma = 1.21$
   Thermostats: $\sigma = 2.21$

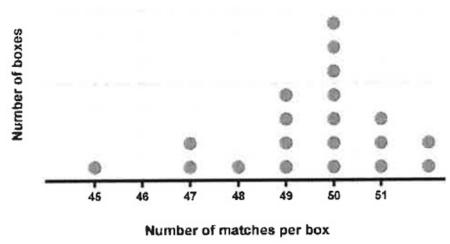
Graphing Data: Dotplots and Stem-and-Leaf Plots

Statistics such as mean, median, and standard deviation are very useful in summarizing data and giving overall trends. But they don't tell the full story. By making a graph of the data, we go beyond the numbers and see shapes and patterns in the data.

Dotplots: Make an x-axis and put one dot for each data point on the axis.

Ex 1 – Number of matches in 20 randomly selected boxes.

45, 47, 47, 48, 49, 49, 49, 50, 50, 50, 50, 50, 50, 51, 51, 51, 52, 52



Stem-and-Leaf Plot: Use a key to determine what the stems and leaves are worth. Do not skip stems

Ex 2 – Gross National Product (per capita) of West African countries

180, 240, 260, 270, 310, 330, 360, 370, 390, 410, 480, 500, 710, 730, 890

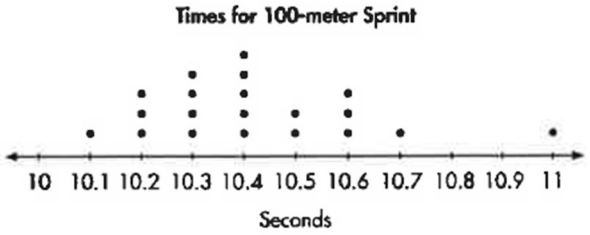
Stem	Leaf
1	80
2	40 60 70
3	10 30 60 70 90
4	10 80
5	00
6	
7	10 30
8	90

Notice how the 6 is still here even though there are no data points in this interval

Key: 4 | 80 means an income of $480.

Complete the following.

1. Using the dotplot shown, find the mean and median sprint time.



2. Construct a dotplot for the fuel efficiency of a random sample of 2015 model year vehicles:
16, 23, 24, 27, 29, 30, 30, 32, 32, 31, 31, 31, 31, 31, 31, 40

3. The following stem-and-leaf plot shows the final exam scores for a class of 10 students. List the scores of each student and find the mean and median of the data set.

stem	leaf
6	9
7	
8	7 8 8 9
9	0 6 7 7
10	0

Key: 6|8 means 68

4. Find the mean and median of the following stem-and-leaf plot.

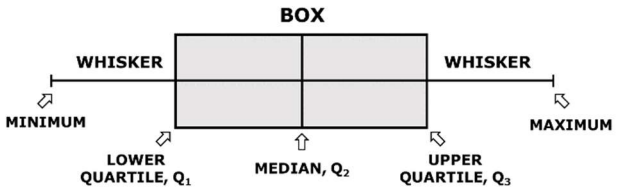
Stem	Leaf
2	0 2 3 6
3	2 3 5 6 7
4	6 8 9
5	4 7
6	2
7	3

KEY: 4|6 = 4.6

Graphing Data: Box and Whisker Plots

If a data set had hundeds of data points, we would need technology to help with creating plots or use a Box and Whisker Plot to see the shape of the data. We use summary statistics to create this type of plot.

Box and Whisker Plot:



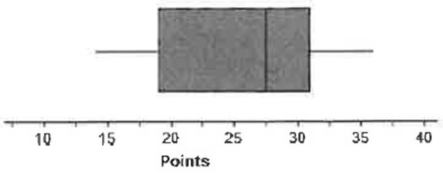
- Minimum: smallest value in the data
- Lower Quartile (Q1): Median of the first half of the data
- Median (Q2): Median of the entire data
- Upper Quartile (Q3): Median of the second half of the data
- Maximum: largest value in the data

The range is the difference between the maximum and minimum values. The Interquartile Range (IQR) is the difference between Q3 and Q1. Each of the four sections of the plot has 25% of the data points.

Ex 1 – Number of points scored by Russell Westbrook in the 2016 NBA Playoffs

14, 14, 16, 19, 24, 25, 26, 27, 28, 28, 29, 30, 31, 31, 35, 36, 36

Min = 14; Q1 = 19, Median = 27.5, Q3 = 31, Max = 36; Range = 22; IQR = 12



Complete the following.

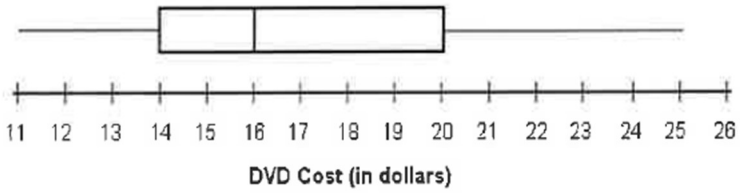
1. Construct a Box and Whisker Plot for the following data.

   17, 21, 24, 26, 31, 33, 36, 37, 41, 48

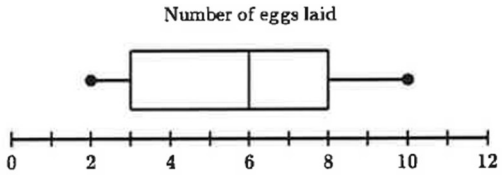
2. Construct a Box and Whisker Plot for the following data.

8, 5, 9, 1, 10, 5, 11, 6, 7, 5, 5

3. Analyze the following Box and Whisker Plot. Find the minimum, Q1, median, Q3, maximum, range, IQR, and mean.



4. A farmer has 168 laying hens. He recorded how many eggs each hen laid in one week. A box and whisker plot is shown. Find the number of chickens that laid:
   a. More than 8 eggs:



   b. Less than 6 eggs

   c. Between 3 and 8 eggs

   d. Between 2 and 8 eggs

Using the TI-84 Calculator

Statistics utilizes a lot of calculator functions. You will get very familiar with the capabilities of your calculator. One area is the Statistics Editor. Below are a few processes to enter data and calculate some of the summary statistics.

1. **Entering Data:** STAT → 1: Edit → enter data in L1 by typing a number followed by ENTER.
2. **Clearing Data:** Highlight the list name (L1, L2, etc.) and pressing CLEAR followed by ENTER.
3. **Sorting Data:** STAT → 2: SortA(L_1)
4. **Finding the Mean:** 2^{nd} STAT → MATH → 3: Mean($L_1$$2^{nd}$ STAT → MATH → 4: Mean(L_1)
5. **Finding the Median:** 2^{nd} STAT → MATH → 4: Mean(L_1)
6. **Finding the Sum:** 2^{nd} STAT → MATH → 5: Sum(L_1)

Complete the following.

1. Entering the following data into L1 and calculate the mean, median, mode, and sum of the data.

   63, 52, 84, 83, 51, 32, 58, 35, 45, 41, 65, 75, 59, 67, 25, 46

2. Entering the following data into L1 and calculate the mean, median, mode, and sum of the data.

   82, 23, 59, 94, 70, 26, 32, 83, 87, 94, 32