

## II. Statistical Graphs – section 3.2

Histograms and Frequency Polygons are statistical graphs used to illustrate frequency distributions.

**Example:** Construct a histogram for the frequency distribution below.

# of Children	# of families
0	8
1	11
2	18
3	11
4	6
5	4
6	2
7	1
8	2
9	1

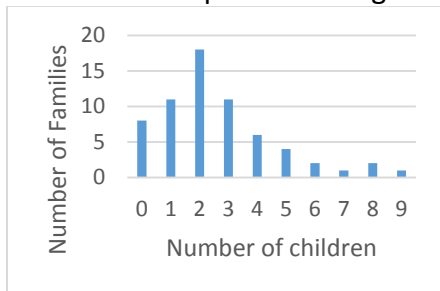
A histogram is just a bar graph. I will make my bars go vertically. It wouldn't be wrong if I made my bars go horizontally.

Start by creating a graph of the first quadrant of an "x" and "y" axis. Use the label of the left column for the x-axis, and the label on the top of the right column for the y-axis.

Place the numbers in the left column beneath the horizontal line. Place the numbers in the right column to the left of the vertical line. You may have to increment the "y-axis" when it is convenient. I incremented this y-axis by 2 as I didn't want to write 18 numbers down. It would have been hard to read the y-axis had I written down 18 numbers.

Make a rectangle above each number on the x-axis the appropriate height.

This is an example of a histogram that models the data in the frequency distribution.

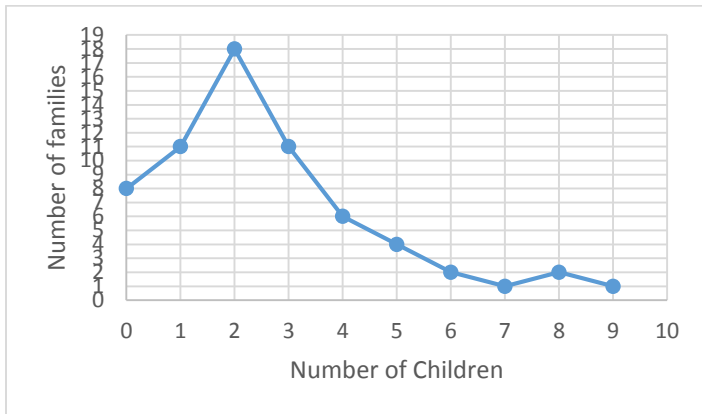


(It is certainly okay if the bars touch. I can't figure out how to make that happen.)

A frequency polygon is just a “line graph”. Let’s construct a frequency polygon to model the same data. I just plotted the points from the frequency distribution and then connected each point with a line segment.

**Example:** Construct a frequency polygon for the data we used to create our frequency histogram.

Start as if you were creating a histogram. Place a point above each point on the “x-axis”. Connect each point with a line segment.



Homework #1-4

1) Create a frequency histogram and a frequency polygon from the data in the frequency distribution below.

Frequency distribution

# of Children	# of families
0	8
1	11
2	18
3	11
4	6
5	4
6	2
7	1
8	2
9	1
Total	64

2) Create a frequency histogram and a frequency polygon from the data in the frequency distribution below.

Frequency distribution

Year	Unemployment rate
1920	5.2%
1930	4.2%
1940	8.7%
1950	5.3%
1960	5.5%
1970	4.9%
1980	7.1%
1990	5.6%
2000	4.0%
2010	9.6%

3) Create a frequency histogram and a frequency polygon from the data in the frequency distribution below. Put the entire class on the horizontal axis.

Income (in thousands of dollars)	Number of families
16-22	2
23-29	5
30-36	4
37-43	3
44-50	1
Total	15

4) Create a frequency histogram and a frequency polygon from the data in the frequency distribution below.

Frequency Distribution

Class	Frequency
40-49	7
50-59	5
60-69	3
70-79	2
80-89	7
90-99	1
Total	25

## Stem and Leaf Displays:

A stem and leaf display is a tool that organizes and groups the data while allowing us to see the actual values that make up the data. To construct a stem and leaf display each value is represented by two different groups of digits. The left group is called the stem and the remaining group of digits is called the leaf. There are no rules for the number of digits to be included in the stem. Basically stem and leaf displays break numbers up. Here are a few ways numbers can be broken up using a stem and leaf display.

53 could get broken up      5                  3  
    Stem                  Leaf

483 could be either      48   3                  or      4      83  
    Stem   Leaf                                  Stem   Leaf

6 could get written      0      6  
    Stem   Leaf

**Example:** The following data represents the ages of 20 guests at 4 PM when happy hour starts at the Yard House. A stem and leaf display has been started. Finish the stem and leaf display.

27	28	29	31	32
39	43	44	44	45
47	50	56	58	59
60	62	68	71	72

Stem	Leaves
2	7 8 9
3	1 2 9
4	
5	
6	
7	

Notice the Stems are in ascending order. The leaves can be in any order BUT most people like them to ascend also.

Also notice that a stem and leaf display looks like a sideways histogram.

I will just add the end of each number next to the appropriate number.

Stem	Leaves
2	7 8 9
3	1 2 9
4	3 4 4 5 7
5	0 6 8 9
6	0 2 8
7	1 2

Homework #5-8: Create a stem and leaf display for the given data.

5) The table below indicates the ages of each student in a recent MAT 142 class. Construct a stem and leaf display.

18	18	18	19	19
20	20	21	25	28
31	35	36	44	49

6) Twenty workers at a local mall were asked how many miles they commute to work one way. The data below gives the result of the survey. Construct a stem and leaf display.

1	3	3	7	7
8	9	9	10	11
13	14	14	15	17
18	20	21	21	23

7) Starting salaries of recent computer science majors (in thousands of dollars) are given in the table below. Construct a stem and leaf display.

42	45	48	49	50	51
55	57	58	59	60	61
62	64	65	66	67	73

8) Fifteen students were asked how many times a week they ate fast food. The results are given in the table below. Construct a stem and leaf display.

0	1	2	4	4
5	8	11	11	13
14	15	20	21	22

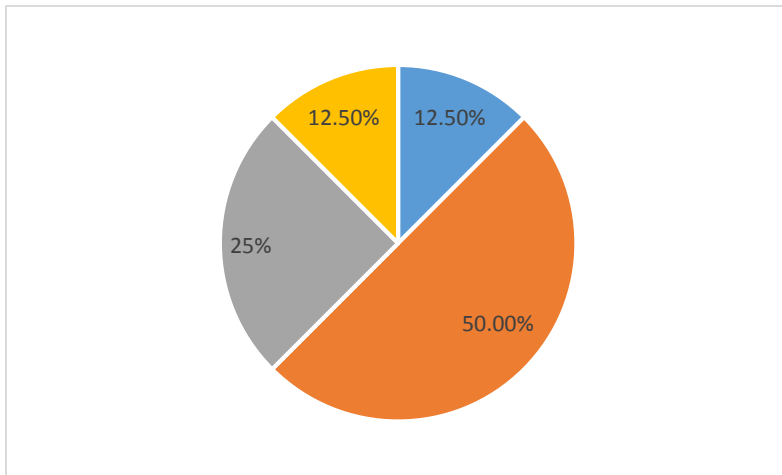
**Circle graphs** (also known as pie charts) are often used to compare parts of one or more components of the whole to the whole.

It will be important to know the relative sizes of regions we are constructing when we are creating circle graphs. Here are some common percent graphed.

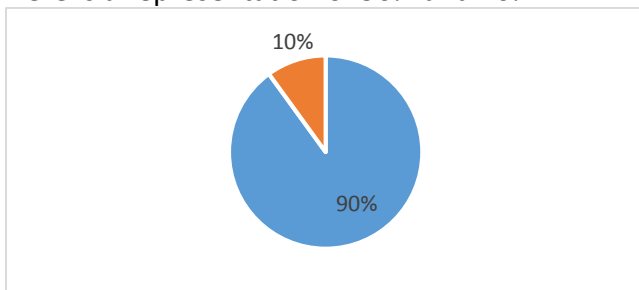
50% takes up half of the graph

25% takes up a quarter of the graph.

12.5% takes up 1/8 of the graph



Here is a representation of 90% and 10%



For the most part I just eyeball it when I create circle graphs. I generally know about how large I need to make a region and I just try to get close. I never measure.

**Example:** 600 people exiting the AMC movie theatre at Arrowhead Mall were asked what type of movie they just watched. The results can be seen below...

Movie Type	# of People
Action	150
Comedy	300
Drama	75
Science Fiction	75

Use this information to create a circle graph

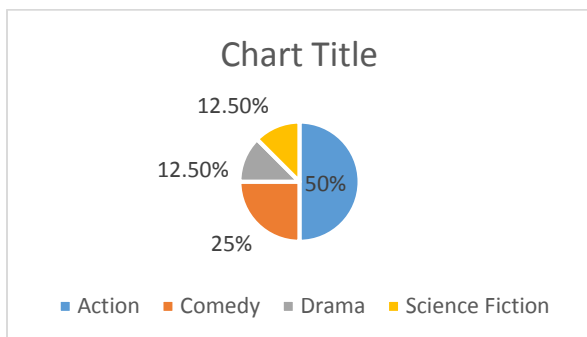
To do this “by hand” we have to do a little math. We need to change each number to a percent, or if you like a degree. I won’t show how to use degrees as percent seems to be more common.

Movie type	# of people	% of total to nearest tenth
Action	150	$\frac{150}{600} = 0.25 = 25\%$
Comedy	300	$\frac{300}{600} = 0.50 = 50\%$
Drama	75	$\frac{75}{600} = 0.125 = 12.5\%$
Science Fiction	75	$\frac{75}{600} = 0.125 = 12.5\%$
Totals	600	100%

Note: The percent column must add up to 100%.

Lastly, create a reasonable picture. The Comedy sector must take up half of the graph. It can be the top of the graph, the bottom or like I showed the right side of the graph.

The Action region needs to take up 25% or one quarter of the graph.



Homework #9-11: Construct a Circle graph from the given data.

9)

Type of cell phone	Number of users
IPhone	50
Galaxy	25
Flip Phone	10
Other	10
No cell phone	5

10)

I Q	Number of people
85 - 100	40
100 - 115	30
115 - 130	10
Higher than 130	5

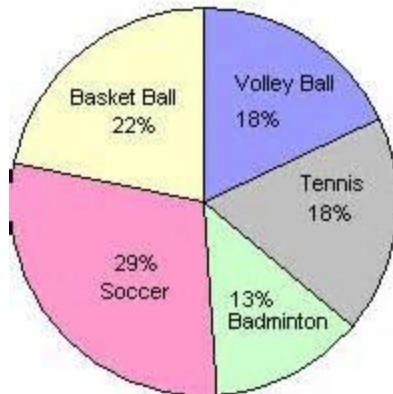
11)

Height	Number of people
5 feet – 5 feet 6 inches	100
5 feet 7 inches to 6 feet	80
Over 6 feet 1 inch	20



**Example:** A survey was given to 200 people. The results are summarized in the circle graph below.

**Students Favorite Sports**



a) How many people's favorite sport is Tennis?

Simply multiply the total number of people by the percent (in decimal form) that say their favorite sport is tennis.

$$200 * 0.18 = 36$$

Answer: 36 people

b) How many more people favored soccer than basketball?

Find out how many favored each.

$$\text{Number that favored soccer: } 200 * .29 = 58$$

$$\text{Number that favored basketball: } 200 * .22 = 44$$

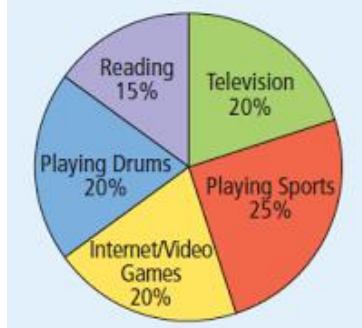
Then subtract the amounts.

$$\text{Answer } 58 - 44 = 14 \text{ more people favored soccer than basketball.}$$

Homework: 12 - 19

12) Andrew spends 25 hours a week doing leisure activities. The results are summarized in the circle graph below.

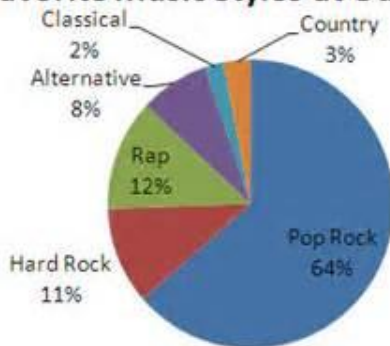
Andre's Weekly Activities (25 h)



- How many hours a week does Andrew spend watching television? (Round to 2 decimals.)
- How much more time does Andrew spend playing sports than he does reading? (Round to 2 decimals.)

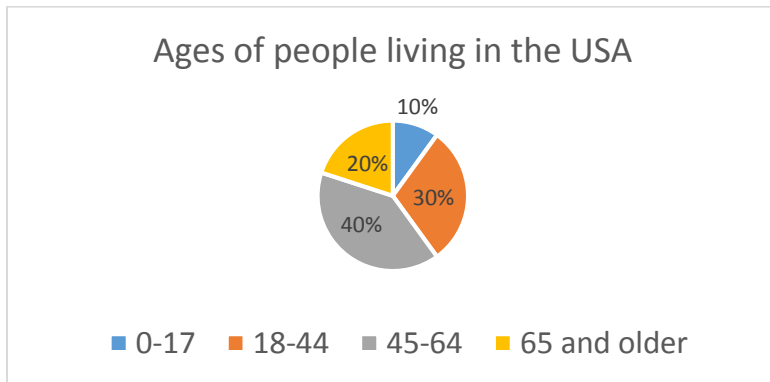
13) A survey was given to 500 students. The results are summarized in the circle graph below.

Favorite Music Styles at Our School



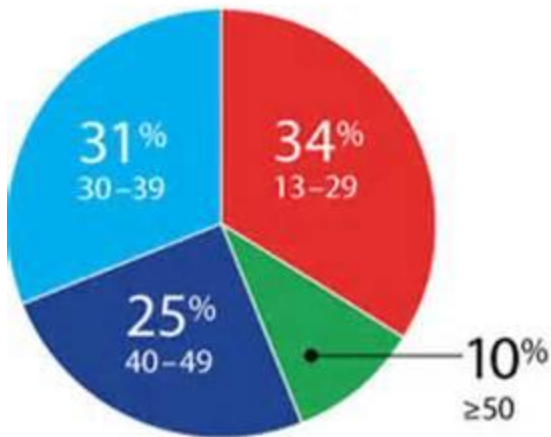
- How many students favorite type of music is country?
- What is the most popular type of music and how many students say it is their favorite?

14) The current population of the USA is approximately 320 million people. The following circle graph summarizes the population of the USA.



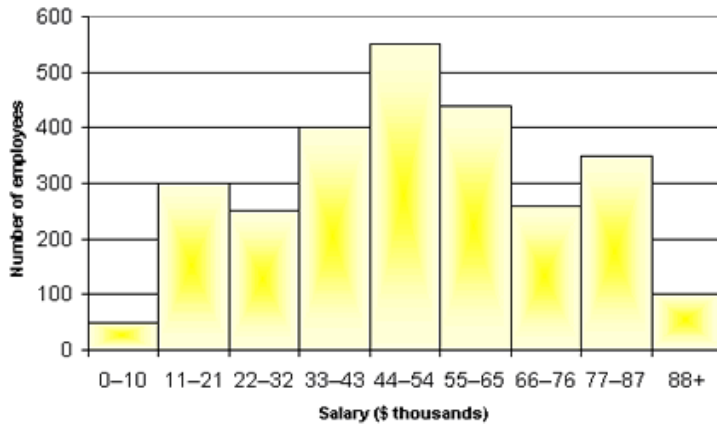
- a) How many people in the USA are 45 or older?
- b) How many are under 45?

15) 300 people attended a concert. The circle graph below summarizes the ages of the people who attended the concert.



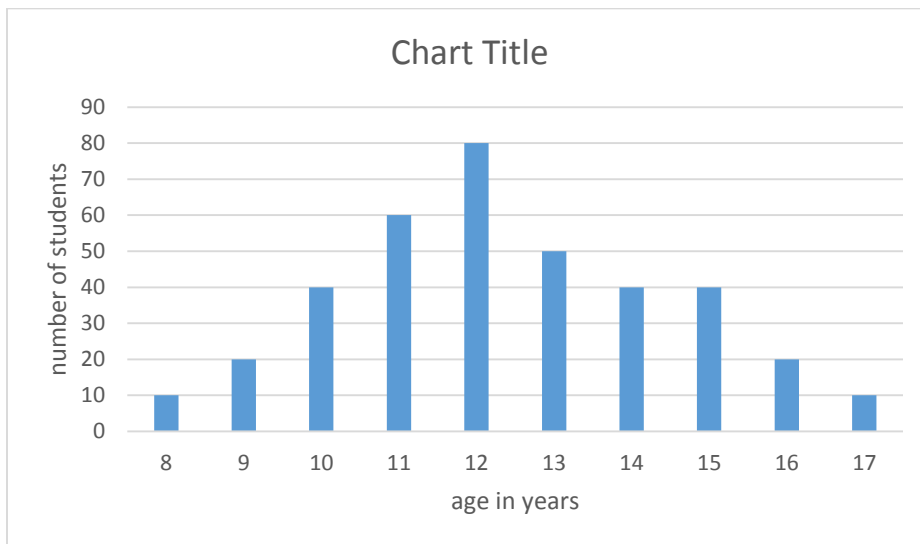
- a) How many people at the concert were 30 or older?
- b) How many were under 50?

16) This frequency histogram represents the salary of employees in a certain company. You will have to estimate some of the numbers, and your answer could be slightly different than mine if your estimates are different.



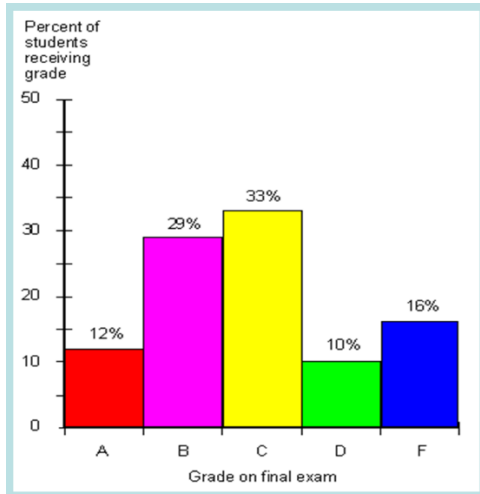
- a) How many employees made at least 44 thousand dollars per year?
- b) How many made less than 33 thousand per year?

17) The ages of people attending a school assembly are summarized in the histogram below. You will have to estimate some of the numbers, and your answer could be slightly different than mine if your estimates are different.



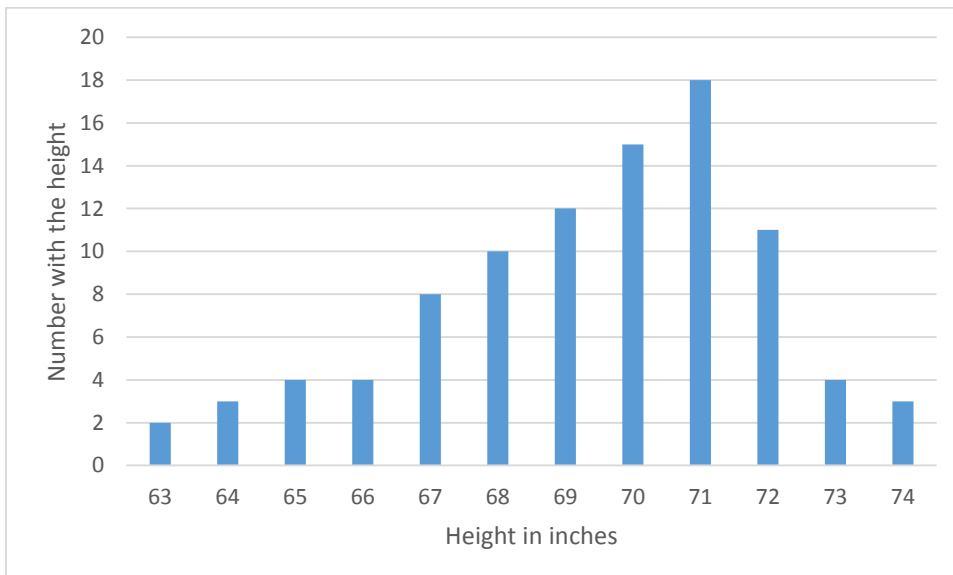
- a) How many people were at least 15?
- b) How many were under 12?

18) 200 students took a final exam and the results are displayed in the histogram below.



- What percent of the students got an A on the final exam?
- How many students got an A on the final exam?
- How many students failed the final, if a grade of a D or F is considered failing?

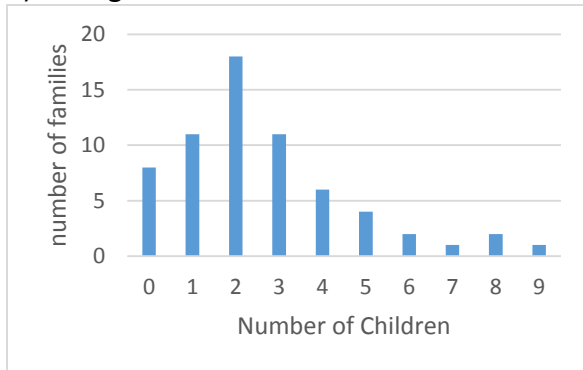
19) 300 men were measured. The results (in percent) are summarized in the histogram below.



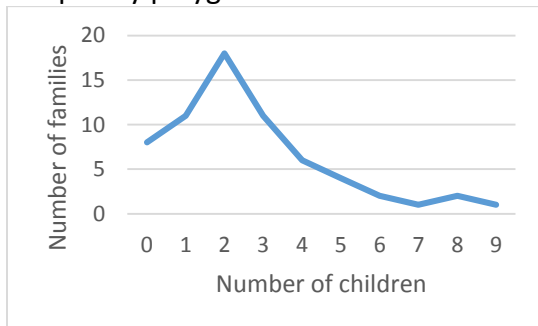
- How many men had heights between 68 and 70 inches inclusive?
- How many men had heights greater than 72 inches?

Answers:

### 1) Histogram

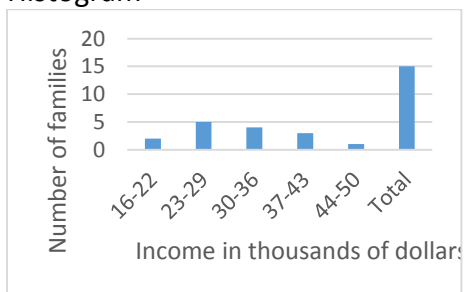


### Frequency polygon

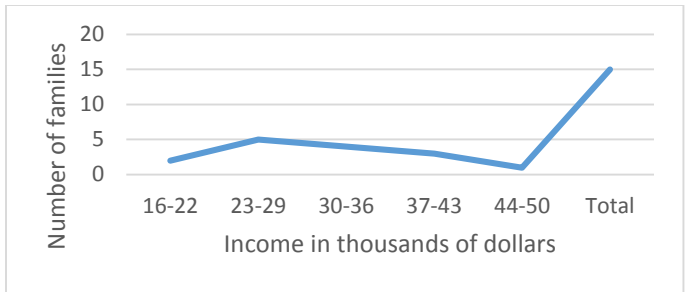


### 3)

### Histogram



### Frequency polygon



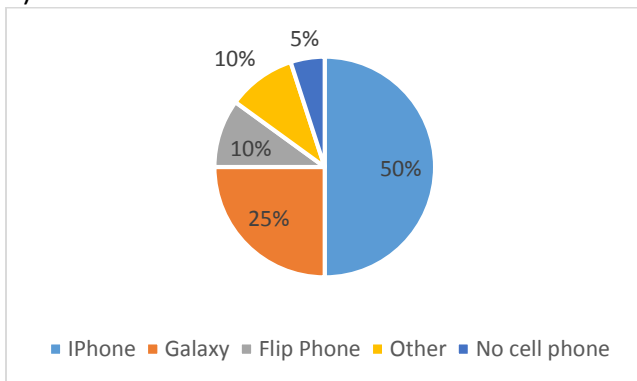
5)

Stem	Leaves
1	8 8 8 9 9
2	0 0 1 5 8
3	1 5 6
4	4 9

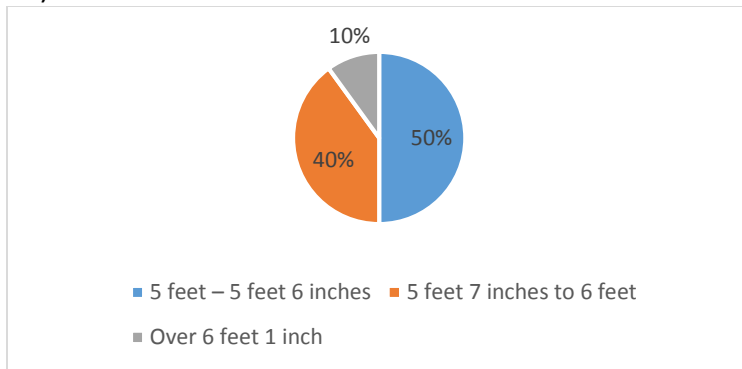
7)

Stem	Leaves
4	2 5 8 9
5	0 1 5 7 8 9
6	0 1 2 4 5 6 7
7	3

9)



11)



13a) 15 13b) pop, 320 15a) 198 15b) 270 17a) 70 17b) 130  
19a) 37 men 19b) 7 men