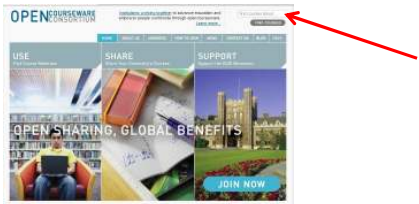


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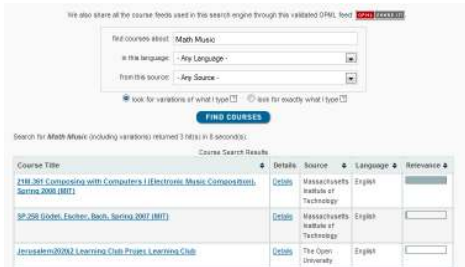
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### Final Project Information

- a) Found under Final Project in Units 6, 7, & 8
  - i. with examples
  - ii. a different example is in Unit 9
- b) Must be in MS Word or MS PPT format.
- c) 5 pages or slides
- d) Select a topic in the course and discuss a potential application for this concept in your chosen profession.

PDF & more are at

[http://www.ramshillfarm.com/Math/Math150/Unit\\_8.html](http://www.ramshillfarm.com/Math/Math150/Unit_8.html)

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# 8.1

## Sampling Techniques

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## Statistics

Statistics is divided into two main braches.

- **Descriptive statistics** is concerned with the collection, organization, and analysis of data.
- **Inferential statistics** is concerned with making generalizations or predictions from the data collected.

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- A statistician's interest lies in drawing conclusions about possible outcomes through observations of only a few particular events.
  - The **population** consists of **all** items or people of interest.
  - The **sample** includes **some** of the items in the population. (per previous student: **"large enough to make the result worth finding and small enough the be manageable"**)
- When a statistician draws a conclusion from a sample, there is always the possibility that the conclusion is incorrect.

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### Types of Sampling

- A **random sampling** occurs if a sample is drawn in such a way that each time an item is selected, each item has an equal chance of being drawn.
- When a sample is obtained by drawing every *n*th item on a list or production line, the sample is a **systematic sample**.
- A **cluster sample** is sometimes referred to as an area sample because it is frequently applied on a geographical basis, or location.

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### Types of Sampling continued

- **Stratified sampling** involves dividing the population by characteristics called *stratifying factors* such as gender, race, religion, or income.
- **Convenience sampling** uses data that are easily or readily obtained, and can be extremely biased.

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### Example: Identifying Sampling Techniques

- a. Participants are selected using a random number generator.
- b. Students at an elementary school are classified according to their present grade level. Then, a random sample of three students from each grade are chosen to represent their class.
- c. Every sixth car on highway is stopped for a vehicle inspection.

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**Example: Identifying Sampling Techniques continued**

- d. Voters are classified based on their polling location. A random sample of four polling locations are selected. All the voters from the precinct are included in the sample.
- e. The first 20 people entering a water park are asked if they are wearing sunscreen.

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**Solution:**

- a) Random
- b) Stratified
- c) Systematic
- d) Cluster
- e) Convenience

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**8.2**

The Misuses of Statistics

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### Misuses of Statistics

- Many individuals, businesses, and advertising firms misuse statistics to their own advantage.
- When examining statistical information consider the following:
  - Was the sample used to gather the statistical data unbiased and of sufficient size?
  - Is the statistical statement ambiguous, could it be interpreted in more than one way?

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### Example: Misleading Statistics

An advertisement says, "Fly Speedway Airlines and Save 20%".

- Here there is not enough information given.
- The "Save 20%" could be off the original ticket price, the ticket price when you buy two tickets or off another airline's ticket price.

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### Example: Misleading Statistics

A helped wanted ad read, "Salesperson wanted for Ryan's Furniture Store. Average Salary: \$32,000."

- The word "average" can be very misleading.
- If most of the salespeople earn \$20,000 to \$25,000 and the owner earns \$76,000, this "average salary" is not a fair representation.

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## Charts and Graphs

Charts and graphs can also be misleading.

- Even though the data is displayed correctly, adjusting the vertical scale of a graph can give a different impression.
- A circle graph can be misleading if the sum of the parts of the graphs do not add up to 100%.

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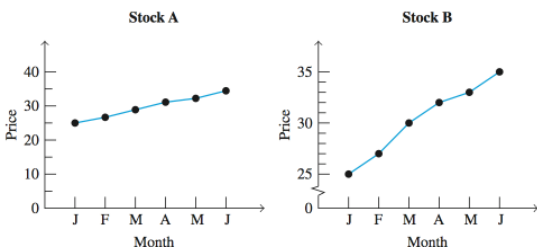
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## Example: Misleading Graphs



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## 8.3

### Frequency Distributions

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### Frequency Distribution

- A *piece of data* is a single response to an experiment.
- A *frequency distribution* is a listing of observed values and the corresponding frequency of occurrence of each value.

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### Example

The number of pets per family is recorded for 30 families surveyed. Construct a frequency distribution of the following data:

# of Pets	Tally	Freq.
0		
1		
2		
3		
4		

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### Rules for Data Grouped by Classes

- The number of classes you will want will depend on the amount and type of data you have.
- The classes should be of the same "width."
- The classes should not overlap.
- Each piece of data should belong to only one class.

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**Class or Class Interval** is a grouping method used to analyze statistical data.

**Lower class limit** is the lower value of the interval.  
**Upper class limit** is the higher value of the interval.

**Midpoint** is the middle value of the class & is found by adding the lower and upper class limits and dividing the sum by 2.

**Class width** is how big or large the interval is. In this course, we will use the **'integral value'** for the width. This means, if there are 3 integers in the class, the width is 3. Often it is found by finding the difference between 2 lower class limits or 2 upper class limits.

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### Example

The following set of data represents the distance, in miles, that 15 randomly selected second grade students live from school.

6.8	5.3	9.7	3.8	8.7
0.5	5.9	0.8	5.7	1.3
4.8	9.6	1.5	7.4	0.2

Construct a frequency distribution with the first class 0 - 2.

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### Solution

Rearrange the data from lowest to highest.

			# of miles from school	Frequency
0.2	0.5	0.8	0.0 - 2.0	5
1.3	1.5	3.8	2.1 - 4.1	1
4.8	5.3	5.7	4.2 - 6.2	4
5.9	6.8	7.4	6.3 - 8.3	2
8.7	9.6	9.7	8.4 - 10.4	3
			Total	15

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# 8.4

## Statistical Graphs

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# Histogram

A histogram is a graph with observed values on its horizontal scale and frequencies on its vertical scale.

Example  
Construct a histogram of the frequency distribution.

# of pets	Frequency
0	6
1	10
2	8
3	4
4	2

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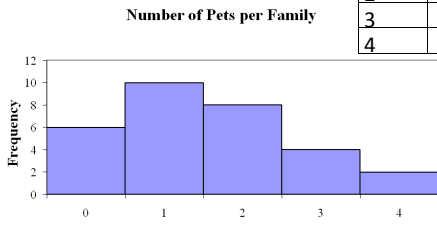
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# Solution

# of pets	Frequency
0	6
1	10
2	8
3	4
4	2



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### Frequency Polygon

A frequency polygon is a line graph with observed values on its horizontal scale and frequencies on its vertical scale.

Number of Pets per Family

Number of Pets	Frequency
0	6
1	10
2	8
3	4
4	2

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### Number of Pets per Family

Number of Pets	Frequency
0	6
1	10
2	8
3	4
4	2

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### Circle Graphs

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

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### Example

According to a recent hospital survey of 200 patients the following table indicates how often hospitals used four different kinds of painkillers. Use the information to construct a circle graph illustrating the percent each painkiller was used.

Aspirin	56
Ibuprofen	104
Acetaminophen	16
Other	<u>24</u>
	200

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### Solution

Determine the measure of the corresponding central angle.

Painkiller	Number of Patients	Percent of Total	Measure of Central Angle
Aspirin	56	$\frac{56}{200} \times 100 = 28\%$	$0.28 \times 360 = 100.8^\circ$
Ibuprofen	104	$\frac{104}{200} \times 100 = 52\%$	$0.52 \times 360 = 187.2^\circ$
Acetaminophen	16	$\frac{16}{200} \times 100 = 8\%$	$0.08 \times 360 = 28.8^\circ$
Other	24	$\frac{24}{200} \times 100 = 12\%$	$0.12 \times 360 = 43.2^\circ$
Total	200	100%	$360^\circ$

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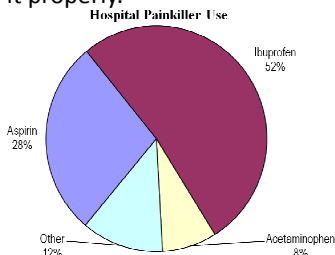
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### Solution continued

- Use a protractor to construct a circle graph and label it properly.



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## Stem-and-Leaf Display

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.

- The left group of digits is called the **stem**.
- The right group of digits is called the **leaf**.

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## Example

The table below indicates the number of miles 20 workers have to drive to work. Construct a stem-and-leaf display.

12	18	3	8	12
25	21	3	15	4
17	27	43	21	16
12	26	35	14	9

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## Solution

Data	Stem-and-Leaf
12 18 3 8 12	0   3 3 4 8 9
25 21 3 15 4	1   2 2 2 4 5 6 7 8
17 27 43 21 16	2   1 1 5 6 7
12 26 35 14 9	3   5
	4   3

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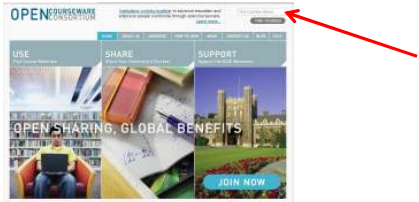
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### Final Project Information

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