

Populations, Samples, and Data  
§1.1 (Day 1)

Statistics – the study of how to collect, organize, analyze, and interpret numerical information.

Population – all measurements or observations of interest.

**Example 1**

If we want to know the average height of all who have climbed Mt. Everest, the population would be: *The height of all who have climbed Mt. Everest.*

**Example 2**

If we want to know the average age of college females in the U.S., the population would be: *The average age of college females in the U.S.*

Population can be existing (complete) or open-ended (incomplete)

**Example 3**

Heights of Presidents from Washington to Obama. COMPLETE

**Example 4**

Heights of Presidents from Obama to the year 2100. INCOMPLETE

Sample – part of a population

Random Sample – a representative sample for the entire population.

Statistics (Advantages and Disadvantages)

**Advantage** – allow us to draw conclusions about a whole population based on information about a sample of that population.

**Disadvantage** – the conclusions are uncertain, but must have a level of confidence.

**Example 5**

In a recent study, 83% (249) of all APHS seniors were taking a math class.

- a. What is the population?
  
  
- b. What is the sample?

Population, Sample, and Data  
§1.1 (Day 2)

**Ways to Produce Data**

1. Sample – produce data from an existing population.
2. Experiment – impose some treatment on subjects to observe their response.
3. Simulation – an arithmetic imitation of a real situation.
4. Census - survey the whole population.

How would you produce data?

How would you produce data through sampling?

Issues with Surveys

1. Are the questions worded in a neutral way?
2. How can you make sure respondents are truthful?
3. Is your sample a true representative of the population?

Levels of Measurement

1. Nominal Level
2. Ordinal Level
3. Interval Level
4. Ratio Level

Nominal (In Name Only) – data at this level consist of names only, or qualities, with no implied criteria by which the data can be identified as greater than or less than other data items.

Example – Social Security Number  
Student ID  
Phone Number



## Random Samples

### §1.2

Random Sample – a sample that is representative of the entire population.

Simple Random Sample – of  $n$  measurements from a population is one selected in such a manner that every sample of size  $n$  from the population has equal probability of being selected and every number of the population has equal probability of being included in the sample.

How can you make a random number table?

#### **Example 1**

If you numbered 500 cars and you wanted to randomly pick 30 out of the total population, which would they be?

#### **Example 2**

Use the random table to get a list of 10 numbers from one to 890.

Graphs  
§1.3

**Types of Graphs**

1. Bar Graph

- a. Can be drawn vertical or horizontal.
- b. Must be uniform width.
- c. Must be uniformly spaced

2. Pareto Chart

- a. Bar graph which are ordered according to their height.  
Longest – left or top  
Shortest – right or bottom

**Example 1**

The average income of people with levels of education is given in the following chart. Make a bar graph with the information.

High School	\$28,500
Grade School	\$16,500
Post Grad	\$53,000
College	\$44,500



**Example 2**

Failure rates in Mr. Whitlow's Probability/Statistics class have been identified in the following areas: 13% Quizzes, 9% Test, 52% Lack of Homework, and 26% Absences. Make a Pareto chart with this information.



Graphs  
§1.3 (Day 2)

**Types of Graphs (Cont'd)**

3. Circle Graphs (pie chart) – used for showing the division of a total quantity into its components. The total quantity (100%) is represented by the total circle.

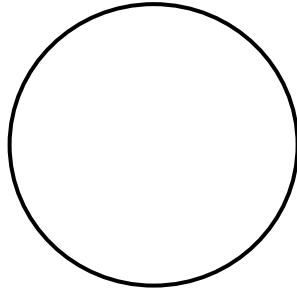
**Example 1**

300 people were surveyed and the following information was gathered based on an average day.

96 talked on the phone ½ hour or less

83 talked on the phone ½ to 1 hour

121 talked on the phone over 1 hour



4. Time Plot – used when we want to see how a variable has changed over time.

\*time is on horizontal scale

\*variable is on the vertical scale

Distance in miles walked in 30 minutes

Week	1	2	3	4	5	6	7	8	9	10
Distance	1.5	1.4	1.7	1.9	1.8	2.1	2.2	2.1	2.3	2.4



Histograms and Frequency Distributions  
§1.4

**Types of Graphs (Cont'd)**

5. Histogram – type of bar graph.

Steps to making a Histogram

1. Decide how many bars (classes) you want.
2. Compute class width:

$$\frac{\text{largest data value} - \text{smallest data value}}$$

$$\text{desired number of classes}$$

\*always round up\*

3. Organize data into a frequency table based on your classes.
4. Since bars should touch, determine class boundaries by computing the halfway point between the upper unit of one class and the lower unit of the next class.
5. Draw the histogram while labeling the title and both axis.

**Example 1**

Football Player Weights

189	206	252	248	211	221	261	270	288	255
245	259	201	195	237	231	268	250	281	

1. 5 classes
- 2.
- 3.
- 4.
- 5.





# Histograms and Frequency Distributions

## §1.4

### Types of Graphs (Cont'd)

#### 6. Relative Frequency Histogram

\*\*This is an additional step to histograms\*\*

$$\text{Relative Frequency} = \frac{f}{n} = \frac{\textit{class frequency}}{\textit{total of all frequencies}}$$

### Example 1

Football Player Weights

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1. 5 classes

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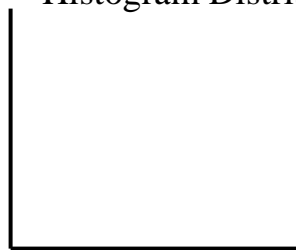
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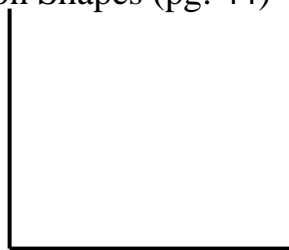
Histogram Distribution Shapes (pg. 44)



Symmetrical



Uniform



Skewed Left



Skewed Right

Stem-and-Leaf Display  
§1.5

**Types of Graphs (Cont'd)**

7. Stem and Leaf Displays

- a. Useful for detecting patterns and extreme data.
- b. Used to help see patterns and generate questions.

**Example 1**

Weights of Carry-On Luggage

30	27	12	42	35	51	7	35
43	0	23	30	17	27	9	18
25	38	29	21	36	39	24	34

