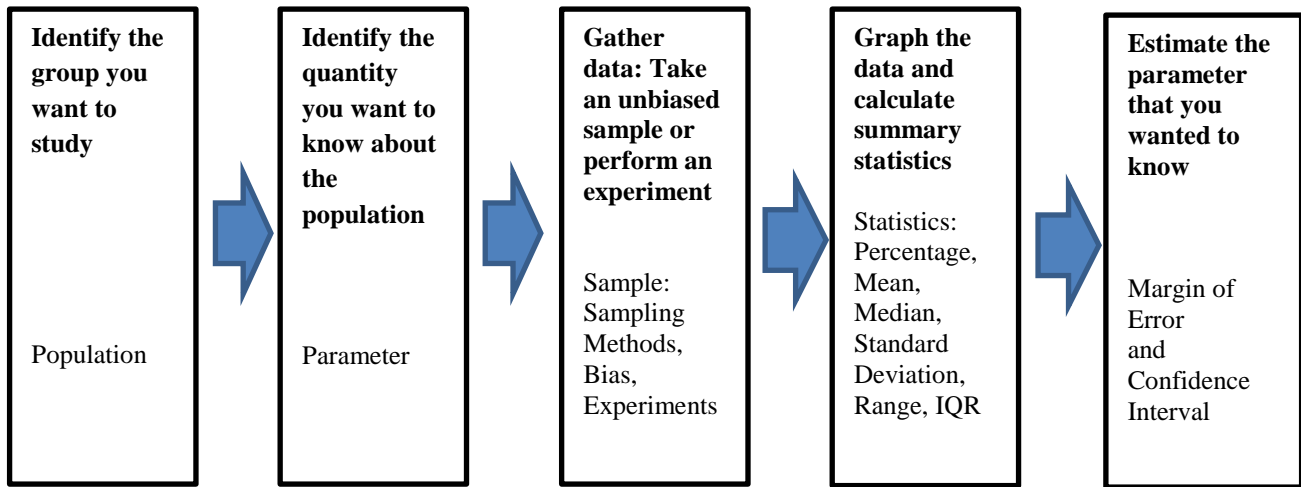


Sections 3.1-3.2 Overview of the Statistical Process and Describing Data  
(Hybrid Version) - **SOLUTIONS**

Group Activity

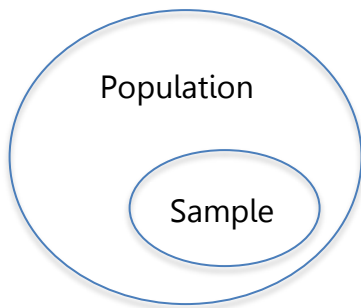
3.1 Overview of the Statistical Process



**Identify the Population, Sample, Parameter and Statistic**

1. For each scenario, a question or problem has been identified. Draw a diagram and describe the population, sample, parameter and statistic. Be specific with units for the parameter and statistic.

A US insurance company wants to know whether households have two cars. A survey of 976 US households found that 32% of households have two cars.



**Population – US households**  
**Parameter – Percentage of US households that have two cars**

**Sample – 976 US households**  
**Statistic – 32% of households in the survey have two cars.**

## Sampling Methods

2. Identify the **sampling method** used:

- a. All the Redland High School students were assembled in the gym, and then separated into groups by grade. Each student was assigned a number, and 25 numbers were randomly drawn from the students in each grade. They were asked if they planned to go to college. **Stratified**
- b. You are standing outside of the grocery store and stop every third person leaving to ask if they purchased milk. **Systematic**
- c. At his book club meeting, Dan asked each member if they had seen the movie made from their current book. **Convenience**
- d. Instead of the method in part a, the administrator at Redland High School chose 100 student numbers randomly and asked those students to report to the office for the survey. **Simple Random Sample**

3. In each situation, identify a potential **type of bias**. You will use each type from the class prep once.

- a. Trident gum did a survey of dentists to see how many would recommend their gum.  
**Self-interest study**
- b. A boss asks their employees if they have taken drugs in the last week.  
**Lack of anonymity**
- c. A researcher on a phone survey asks, "Do you plan to vote for the school district bond or would you rather see our schools crumble?"  
**Loaded question**
- d. A survey was given to a random sample of students but three students didn't return the survey.  
**Non-response bias**
- e. A survey about PCC student's experiences in Math 105 was given to students at Rock Creek and Sylvania.  
**Sampling bias (They did not include Cascade and SE)**
- f. A survey asks people for their weight.  
**Response bias. Depending on the context, people may not give their true weight**
- g. A broadcast email was sent to all PCC students with a satisfaction survey.  
**Voluntary response bias**

4. For each of the following, identify the **type of study** and fill in the corresponding columns. Leave the remaining boxes blank.

| Study   | Observational                    | Observational: Case study            |                                   | Experiment   |  |  |
|---|----------------------------------|--------------------------------------|-----------------------------------|--|--|--|
|   |                                  | Controls                             | Cases                             | Control Group                                      | Treatment Group  | Blinding   |
| Over a 6-month period, among 100 people with bipolar disorder, patients given a high dose of omega-3 fats improved more than those given a placebo. Patients didn't know which they were given, but the experimenters knew.   |                                  |                                      |                                   | People with bipolar disorder receiving the placebo | People with bipolar disorder receiving high dose of omega-3 fats | Single-blind (patients don't know but those giving the pills do)                           |
| A National Cancer Institute study of 716 melanoma patients and 1014 cancer-free patients found that those having a single large mole had twice the risk of melanoma.  |                                  | Patients without a single large mole | Patients with a single large mole |  |  |  |
| Over the period of one-year, researchers determined which airline had the lowest percentage of canceled flights.  | Observational (not a case-study) |                                      |                                   |  |  |  |
| 1000 people were randomly separated into two groups—one group was assigned to exercise for 45 minutes daily, and the other group was instructed not to exercise. The participants in the exercise group reported falling asleep within 15 minutes of going to bed, but those not exercising laid awake for at least 30 minutes. |                                  |                                      |                                   | People not exercising                              | People exercising  | No Blinding (participants know if they are in the exercise group)                          |
| 500 patients with migraine headaches receive a shot to see if it helps reduce the frequency of the headaches. The nurses giving the shots write down the code on each syringe and the patient name. The syringes look identical, but half contain the new medicine and half contain saline.                                     |                                  |                                      |                                   | Patients receiving saline (no medicine)            | Patients receiving new medicine                                  | Double-blind (neither patients nor nurses administering know which syringes have medicine) |

## Confidence Intervals

5. The table below lists results for a Gallup poll conducted via random telephone interviews in October 2015. Assume that the margin of error is 4 percentage points.

a. Find the confidence interval for each category.

|   | American adults  | 18-34 years old  | 35-49 years old  | 50-64 years old  | 65+ years old    |
|---|------------------|------------------|------------------|------------------|------------------|
| Support Legalizing the use of Marijuana | 58%              | 71%              | 64%              | 58%              | 35%              |
| Confidence Interval                     | <b>54% - 62%</b> | <b>67% - 75%</b> | <b>60% - 68%</b> | <b>54% - 62%</b> | <b>31% - 39%</b> |

b. For which age group(s) can you claim that over half of the people support legalization of marijuana? Explain.

**For all age groups except those 65 and older, we can claim that over half of them support legalization of marijuana.**

c. For which age group(s) can you claim that the majority of people do not support legalization of marijuana? Explain.

**For those 65 and older, we can claim that the majority do not support legalization of marijuana.**

### 3.2 Describing Data

Please complete the anonymous survey online. The link is in D2L. This will give our class some data to work with.

#### Types of Data

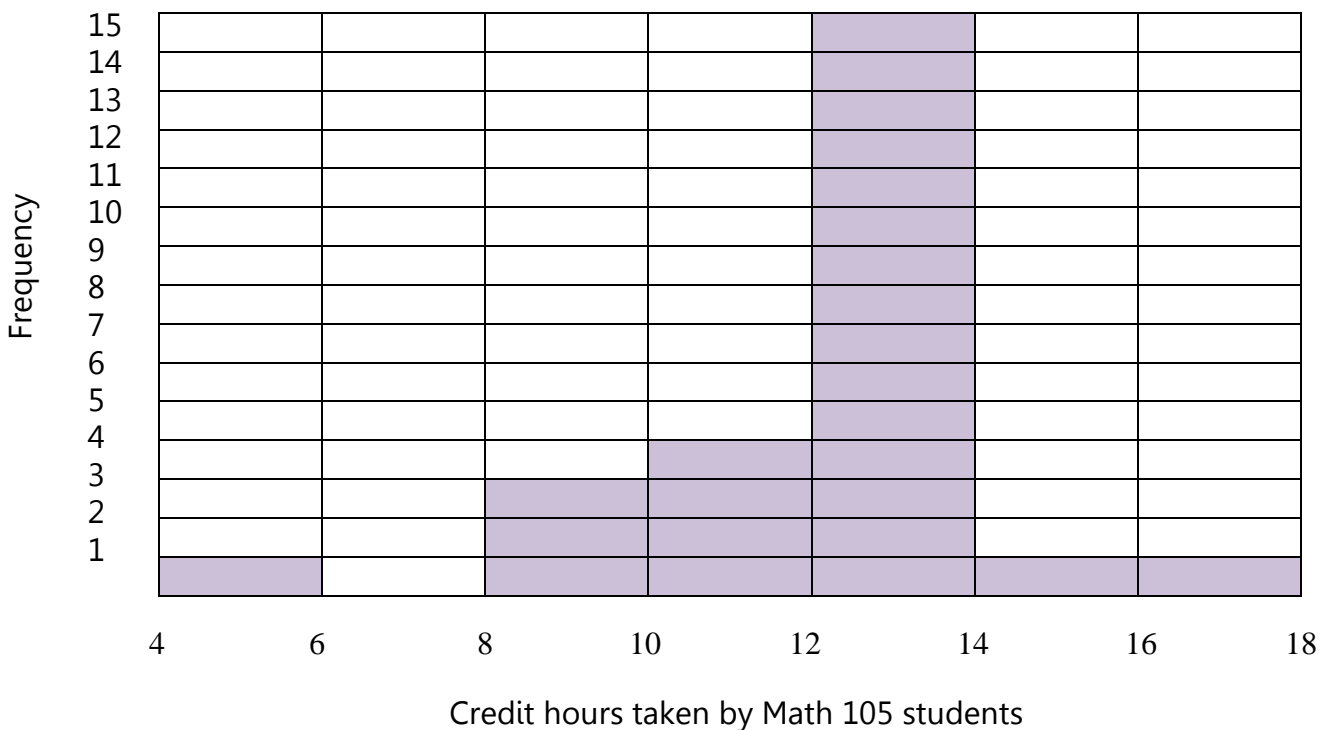
6. For each question in the survey, determine whether the data is qualitative or quantitative.

1. How do you identify your gender? **Qualitative**
2. What is your age? **Quantitative**
3. How many credits are you taking this term? **Quantitative**
4. What is your main mode of transportation to campus? **Qualitative**
5. How long is your pinky finger to the nearest half-centimeter? **Quantitative**

#### Quantitative Variables and Histograms

7. For the credit hour question, here is some data from a previous Math 105 class. Make a histogram by hand, using a bin-width of 2 credits. Label and title your graph.

4, 12, 12, 11, 12, 8, 15, 12, 12, 12, 12, 11, 12, 12, 11, 8, 11, 13, 12, 13, 12, 16, 12, 12, 8



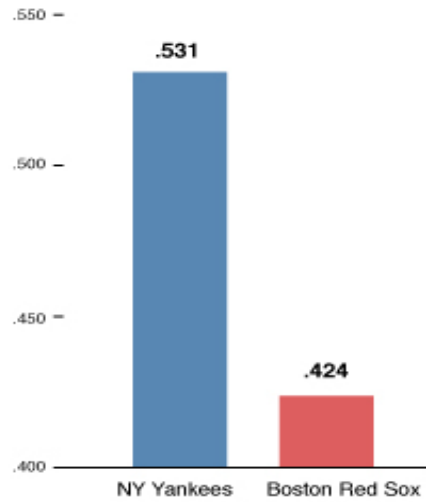
8. What is wrong with these graphs? Write down as many problems as you can find.

a. Ticket Prices



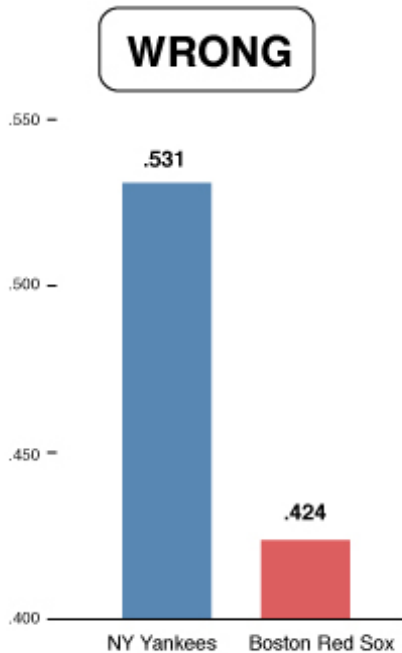
There is a visual distortion because instead of using bars, the balls increase in height and width. The baseball ticket is twice as much, but the area appears to be 4-8 times as much.

b. Percentage of Victories



Not starting at zero can make differences look larger. The difference between 42% and 53% is not that large. The scale should start at zero

Percentage of victories



Percentage of victories

