

Types of Variables:

**DATA** consists of the numbers or categories recorded for the observational units in a study.

A **VARIABLE** is any characteristic of a person or thing that can be assigned a number or category.

**VARIABILITY** is the phenomenon of a variable taking on different values or categories from unit to unit

The **OBSERVATIONAL UNIT** of any study is who exactly you are looking at in that study.

**CATEGORICAL VARIABLES:** variables that put objects into categories *for example heads or tails, boys or girls, democrats or republicans, your letter grade in a course (A, B, C, D, or F)...*

When a variable is categorical it can also be classified as **BINARY** if it only has two possibilities *like heads or tails, girls or boys, ...*

**QUANTITATIVE VARIABLES:** variables represented by a number that changes with each study *for example the cost of gas, your percentage grade in a course, baseball stats for a player...*

**Caution:** summaries such as average height in class or percentage of students in class who have a cell phone are not variable for students in the class because there is only one value for the class. To determine whether something is a variable ask yourself whether or not it represents a question that can be asked of each observational unit.

**DISCRETE VARIABLES:** can only have a whole number value (no decimals) such as the number of blue m & m's in a bag or moons orbiting a planet. It is something that can be counted.

**CONTINUOUS VARIABLES:** can have a range of values including decimals such as the cost of gas or time it takes an individual to run a mile. It is something that can be measured.

1) Using the data we collected, what are the observational units?

**Men and women in this class**

2) Using the data we collected, what are the variables?

**Beats per minute and color of shirt**

3) Using the data we collected, what is the categorical variable?

**Color of shirt**

4) Using the data we collected, what is the quantitative variable?

**Beats per minute**

5) Using the data we collected, what categorical variable is binary?

**None**

6) Using the data we collected, which variable is discrete?

**Beats per minute**

7) Using the data we collected, which variable is continuous?

**None**

8) Using the data we collected, are any of our values not a variable?

**Total number of men and women in the class**

Now try these:

Suppose the observational units are the 50 states. Identify which of the following are variables and which are not. Also classify any variables as categorical (binary or not) or quantitative. Also decide whether they are discrete or continuous.

- 1) gender of state's current governor  
**Variable, categorical, binary**
- 2) number of states that have a female governor  
**Not a variable**
- 3) percentage of state's residents older than 65 years of age  
**Variable, quantitative, continuous**
- 4) highest speed limit in the state  
**Variable, categorical, not binary**
- 5) whether or not the state's name contains one word  
**Variable, categorical, binary**
- 6) average income of the adult residents of the state  
**Variable, quantitative, continuous**
- 7) how many states were settled before 1865  
**Not a variable**

Now back to the first day data (purple paper).

When I collect these from the class and look at the data, what are the observational units?

**Students**

Go through each question and write down the following next to each question:

- 1) Variable or not?
- 2) categorical (binary?) or quantitative?
- 3) discrete or continuous?

This will be collected.