

2020 AP Statistics Review

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Contents

1	Working with Data	5
1.1	Data, what is it?	5
1.1.1	Context	5
1.1.2	Types of Data	6
1.2	Displaying Data	6
1.2.1	Displaying Categorical Data	6
1.2.2	Displaying Quantitative Data	8

Chapter 1

Working with Data

1.1 Data, what is it?

In this section, we'll be working with data. Remember, data are **values** along with their **context**.

1.1.1 Context

When describing the context of data, it is important to consider the W's

- Who? - Who was the data collected from?
- What? - The variables recorded from each experimental unit, and the unit of measurement. What type is the variable? Quantitative or categorical?
- When? - When was the data collected?
- Where? - Where was the data collected?
- Why? - Why was the data collected?
- How? - How was the data collected?

Data without context is useless. For example, consider:

1.2, 3.7, 4.4, 2.2

Are these data? No. These are just numbers without any context. Numbers without any context mean nothing.

1.1.2 Types of Data

There are two types of data. These include *categorical* and *quantitative* data. These two types of data must be expressed differently.

Definition 1.1.1. Categorical Variable: A categorical variable is a variable that can take on one of a limited amount of possible values. Individuals are assigned to a group by some qualitative property. Examples: race, sex, eye color.

Definition 1.1.2. Quantitative Variable: A quantitative variable is a variable that is measured on a numeric scale. Examples: age, height, weight.

1.2 Displaying Data

When displaying data, it is important to follow the *area principle*.

Definition 1.2.1. Area Principle: The area principle states that the area of a graph should equal the magnitude of the data it represents.

Be careful, as many 3D graph types can violate the area principle.

1.2.1 Displaying Categorical Data

Categorical data are displayed primarily with 2 types of visual charts: Bar graphs and pie charts. It can also be expressed with a frequency table, like the one in Figure 1.1.

Figure 1.1: An example frequency table

Sex of Respondents			
Sex	Male	Female	Total
Frequency	13	10	23

Bar Graphs

There are many types of bar graphs. They include normal bar graphs, frequency bar graphs, and stacked bar graphs. Below are examples of

different types of bar graphs. **It is important that the bars do not touch each other. This signifies the bars are ordered. Categorical variables cannot be ordered in a meaningful way, so this is wrong.**

- Normal Bar Graph: Displays the total number of cases in each category.
- Relative Frequency Bar Graph: Displays the relative frequency (percentage or decimal) of each category. All relative frequencies add up to 100%, or 1.
- Stacked Bar Graph: Shows comparisons between categories of data.

Figure 1.2: An example of a bar graph

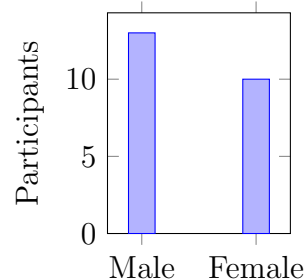


Figure 1.3: An example of a relative frequency bar graph

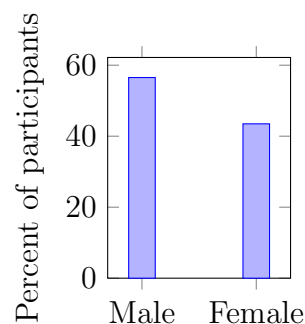
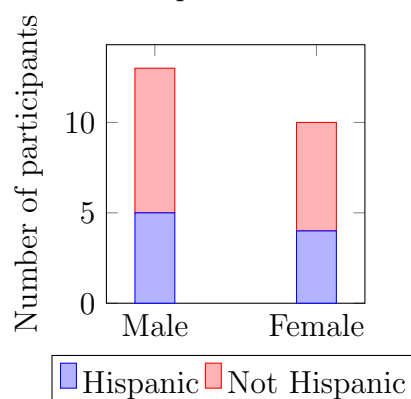


Figure 1.4: An example of a stacked bar graph

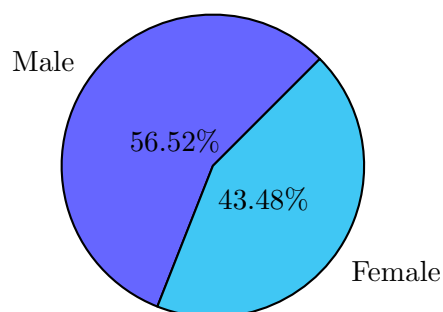


Pie Charts

While bar graphs are great for looking at numerical values, pie charts can be useful when determining the percent composition of the categories. Below is an example of a pie chart.

As you can see, the pie chart does not violate the area principle. Each "slice" of a pie chart grows in size. Polar area charts, which are similar to pie charts, do not obey the area principle. You should also see that the sum of the relative frequencies equals 100%, or 1.

Figure 1.5: An example pie chart



1.2.2 Displaying Quantitative Data

Displaying quantitative data is a bit different from displaying categorical data. Display methods are typically box-and-whisker plots, histograms, and stem plots.