

Chapter 3 – Graphical and Tabular Displays of Data
Section 5 – Misleading Graphical Displays of Data

Objectives

1. Explain why a certain class width of a histogram can emphasize or de-emphasize an aspect of a distribution.
2. Explain why the starting value of the vertical axis of a bar graph or a time-series plot can emphasize or de-emphasize an aspect of a distribution.
3. Explain why non-uniform scaling can be misleading.
4. Explain why three-dimensional graphs can be misleading.

Vocabulary

None

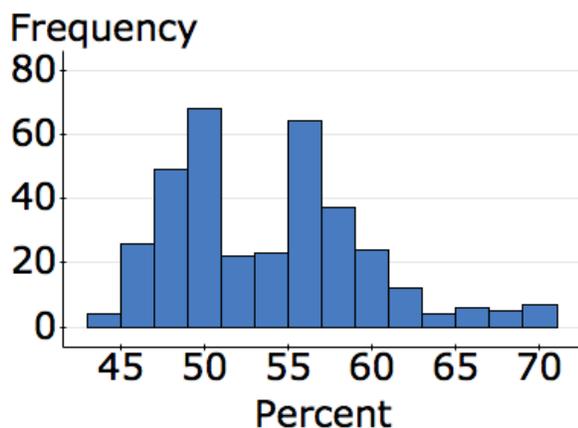
Lesson/Activity

OBJECTIVE 1 – Explain why a certain class width of a histogram can emphasize or de-emphasize an aspect of a distribution.

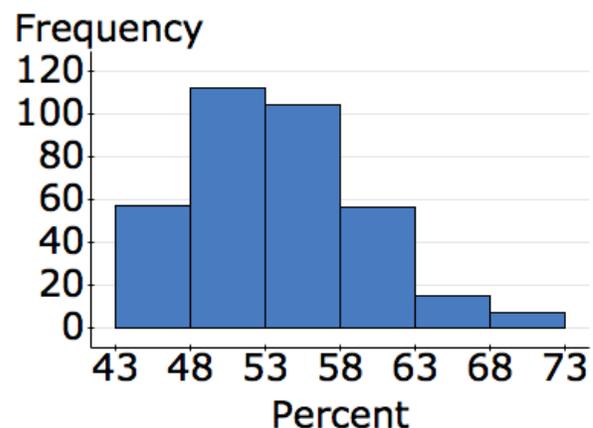
1. The daily approval ratings of President Obama are described by the following histograms. The left histogram describes the daily approval ratings in 2009 using a smaller class width (2 percentage points), and the right histogram describes the same ratings using a larger class width (5 percentage points). Which of these histograms is misleading? Explain.

Source: Rasmussen Reports

Approval: Small Class Size



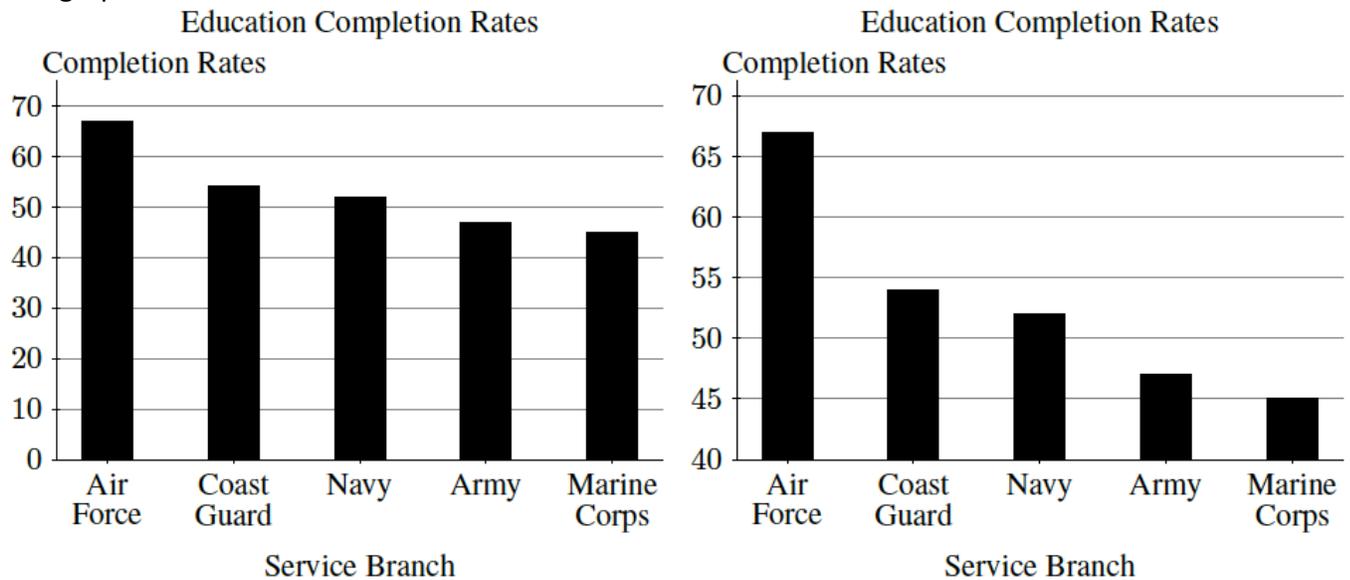
Approval: Large Class Size



When viewing a histogram, keep in mind that a certain choice of class width can emphasize or deemphasize certain aspects of the distribution.

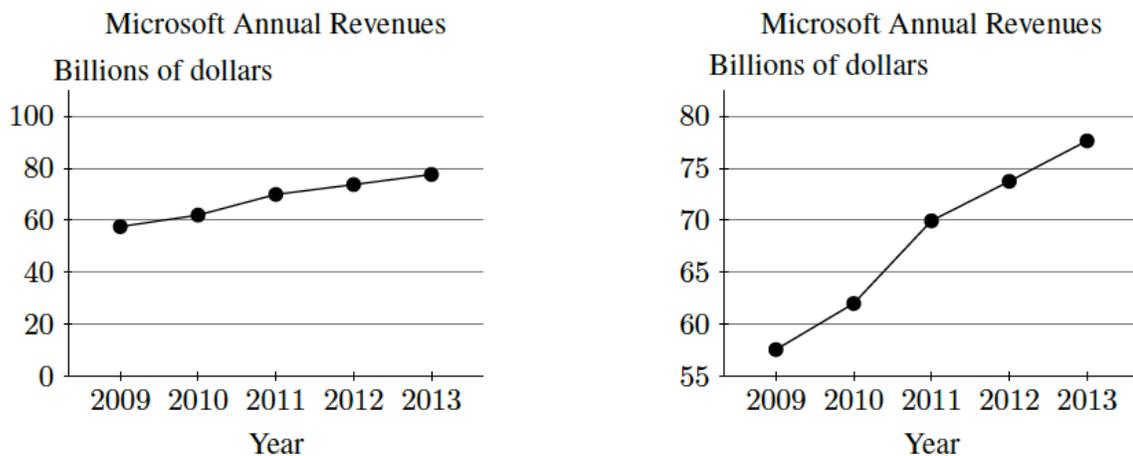
OBJECTIVE 2 – Explain why the starting value of the vertical axis of a bar graph or a time-series plot can emphasize or de-emphasize an aspect of a distribution.

2. The percentages of veterans who used GI Bill benefits from 2002 through 2013 to complete educations ranging from vocational training to post-graduate are described by the following bar graphs for various service branches.



Source: *Student Veterans of America*

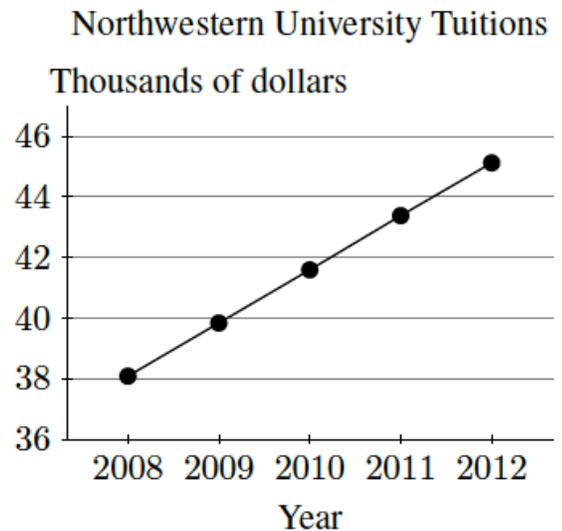
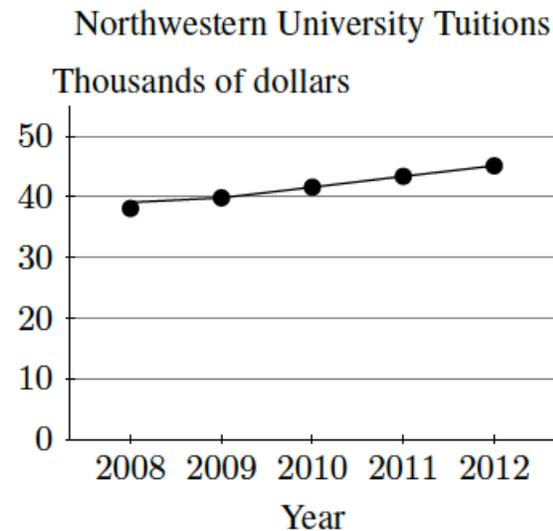
- If the Air Force wants to convince potential recruits how much better the education completion rate is for Air Force veterans than for veterans of the other four service branches, which bar graph would it display? Explain.
 - If the Navy wants to convince potential recruits that the education completion rate for Navy veterans is very close to the rate for Coast Guard veterans, which bar graph would it display? Explain.
 - From which bar graph can you better estimate the education completion rate for Coast Guard veterans? Explain. Estimate the rate.
3. The annual revenues of Microsoft are described by the following time-series plots for various years. If Microsoft wants to emphasize the growth of its revenue, which time-series plot would it want to display? Explain.



Source: *Microsoft Corporation*

If the vertical axis of a time-series plot does not start at 0, the changes in the variable described by that axis are being emphasized.

4. Northwestern University tuitions are described by the following time-series plots for various years, where the starting year of the academic year is shown on the horizontal axis. If Northwestern wants to deemphasize how much its tuition has increased, which time-series plot would it want to display?

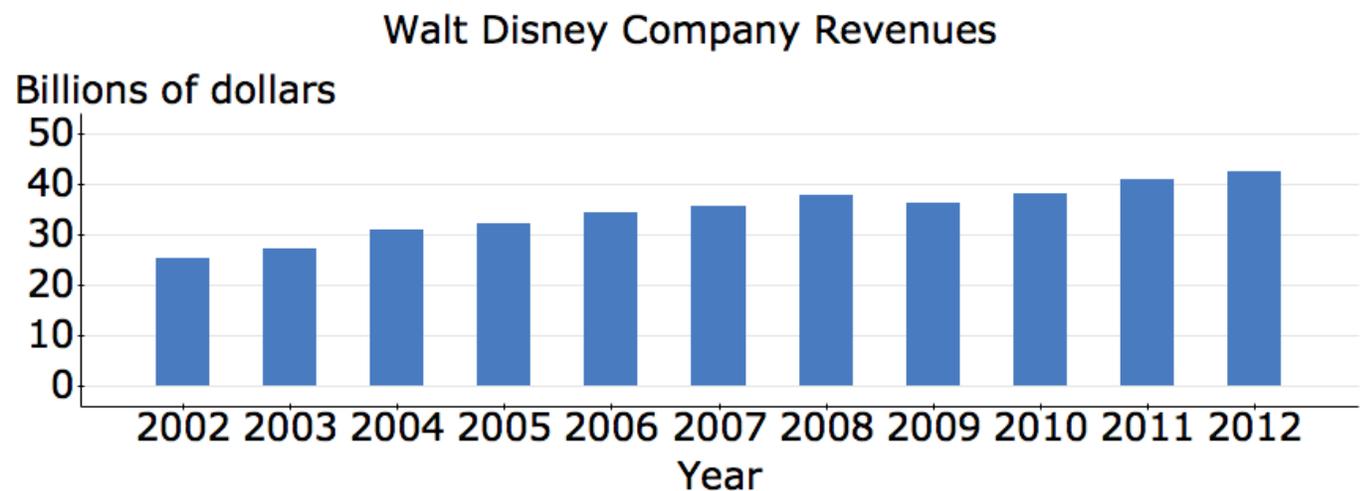


Source: *Northwestern University*

If the vertical axis of a time-series plot starts at 0, be aware that the changes in the variable described by that axis are being de-emphasized.

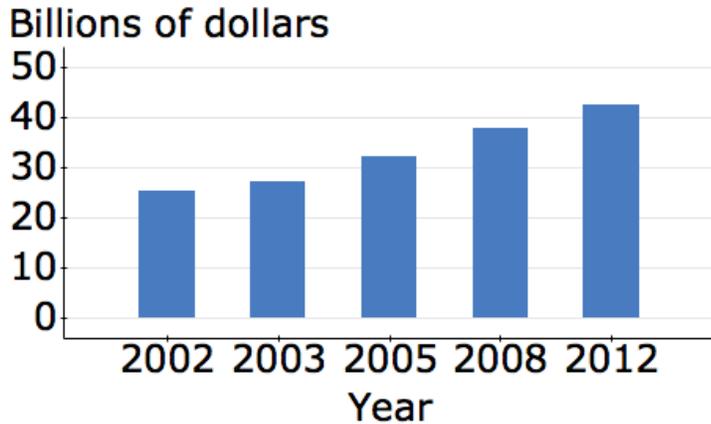
OBJECTIVE 3 – Explain why non-uniform scaling can be misleading.

5. The revenues (in billions of dollars) of the Walt Disney Company are described by the following bar graphs for various years. If Walt Disney wanted to emphasize its growth in revenue, which bar graph would be more convincing? Why is that bar graph misleading? What type of graph would contain the same information but not be misleading?



Source: Walt Disney Company

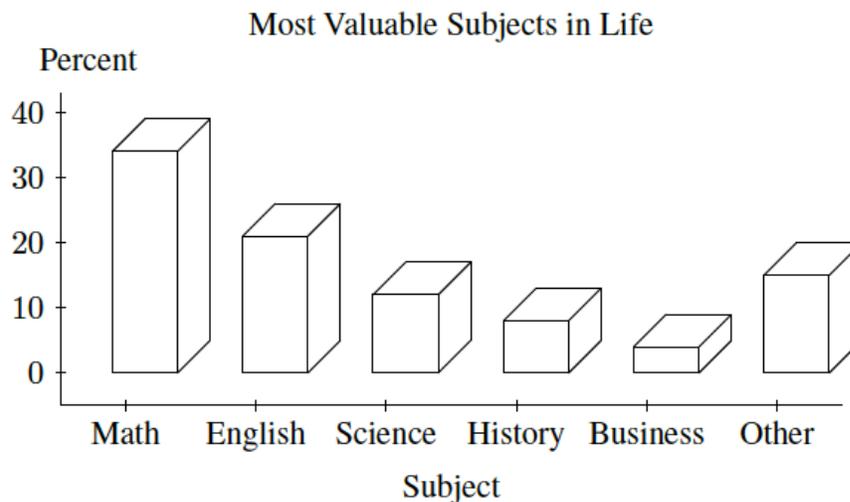
Walt Disney Company Revenues



If the categories for a bar graph are various years and those years do not increase by the same amount, the bar graph can be misleading. A time-series plot would be a better graph to use.

OBJECTIVE 4 – Explain why three-dimensional graphs can be misleading.

6. A total of 2059 randomly selected adults were asked which school subject has been the most valuable to them in their lives. Their responses are described by the following three-dimensional graph.



Source: The Gallup Organization

- What is confusing about this graph?
- Determine a better type of graph and draw it.
- Which subject received the most votes? What percentage of adults voted for it?

Homework/Assessment

1, 3, 5, 7, 9, 11, 13, 15, 17, 20, 22