

Each of us will spend much more of our time reading graphs than actually making graphs for others to read. With good software, color printing, and videos, there are many more interesting and useful complex graphs available to us than even just a few years ago.

Most of section 5C is about making graphs of types you have seen before. This selection of types of graphs is quite complete for graphs to represent the values on one variable. We will discuss reading those and making those today

Section 5D is about reading more sophisticated graphs. This section is NOT a complete list of all types of graphs. The point here is to see a variety of graphs that give rather complex information in a form that is easier to understand than just numbers or numbers and words.

Here's an introduction to this 5D – 2 parts:

<p>Gapminder.org Hans Rosling uses talks about the important parts of the history of the world over the last hundred years with data.</p> <p>See this 5-minute introduction on YouTube: https://www.youtube.com/watch?v=jbkSRLYSojo</p> <p>In our text, see 5D exercise 24, Figure 5.37 (with all the large colored dots.) See the video first. It will make this graph in our text easier to understand.</p>	<p>Activity 1: Historical data about deaths from various diseases in the US over the last hundred years. p. 337, Figure 5.17.</p> <ul style="list-style-type: none">* Which of these diseases has a higher death rate at the end of this time period than the beginning?* Which of these diseases has a higher death rate than the other three in 2004?* Explain why this says that the death rate from all four of these diseases combined in 2004 is about 560 per 100,000 people.* Explain why this says that the death rate for cardiovascular disease in 2004 is about $550 - 200 = 350$ per 100,000 people.
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Section 5D is one of the most interesting and useful sections of our course, I think. You will understand it better if you look at each graph and think about some questions to ask yourself about it. So think about it a bit before you read what the author of our book tells you about it.

The activities 6 - 12 on the last 2 pages of today's handout give you some direction about how to do that.

Section 5C.

Activity 2: What is the difference between quantitative data and qualitative (categorical) data? See p. 322. Do Example 2. Then do exercises 19, 20, 22, 24.

Discussion: Different types of graphs are appropriate for the different types of data.

Quantitative data	Qualitative (categorical) data
Bar Chart shows single number summaries for different groups	Frequency table shows the distribution of the values
Frequency table shows the distribution of the values	Bar graph shows the distribution of the values
Histogram shows the distribution of the values	Pie chart shows the distribution of the values
Line Chart shows the distribution of the values	
Time-Series diagram shows the pattern of the values over time	

Graphs:

Qualitative (categorical) data:

I expect that you could easily **make a frequency table like that in Example 1**, p. 321 – either by hand or using Excel. (Using Excel, you will count the frequencies yourself and type that into the spreadsheet. Then use formulas in the spreadsheet to compute the relative frequencies and cumulative frequencies.

I expect that you could easily **make a bar graph of that data by hand**. (p. 323. Figure 5.3.) It’s also easy to make this bar chart with Excel (p. 324). I will not expect you to make a pie chart by hand.

Activity 3: Type in this frequency table to a spreadsheet now and use Excel to make a bar graph. Then use Excel to make a pie chart of the data. Read about the important labels to include on p. 325. Make sure to include those.

In the grade data, there is an obvious ordering of the data values. But in Example 6 (p. 327) we have data on student majors where there is no obvious ordering. So the majors on the bar chart might be ordered in any way. In that example, they were ordered from highest percentage down. That is one common ordering if you don’t have any reason to use a different one.

Quantitative Data:

Usually we are interested in the distribution of the values of the quantitative variable. For that we need a frequency table, histogram, and/or line graph.

But there is one case where a **bar graph** is appropriate. See Example 4, page 325, where we have quantitative data on several different countries. Look at the bar graph on the next page. Could you make that?

Frequency tables and binning. There are always multiple possible choices for how to do the binning in making a frequency table of quantitative data. We do not expect you to make those choices. In this text, we will tell you what bins to use as is done in example 3, p. 322-323. Then graph this data with a histogram or a line chart, which start with a frequency table.

(However, any statistical software will automatically make appropriate binning choices for you (and usually give you flexibility to change them) which makes it very easy to make histograms. Excel does not do that so we will not use Excel to make histograms or line charts. Also, the histogram option in Excel does not make the bars of the histogram touch each other, which it should, so they are not good histograms anyway.)

Activity 4: Groups. Discuss Example 3 (p. 322-323) frequency table of grades and Figure 5.9 (p. 328) histogram and line graph of this frequency table. Does everyone in your group agree that you could make those by hand?

Activity 5. Groups. **Time-series diagram.** Read the definition of a time-series diagram on p. 328. Find an example of a time-series diagram without turning any pages from there. Do you suppose we are going to give you the data and ask you to make this type of diagram by hand? Why or why not? Then find one exercise in this section that involves a time-series diagram. Did they ask you to make that diagram by hand?

Back to 5D.

Activity 6. Groups. Multiple Bar Graphs. See Figure 5.15 on p. 336.

1. If the person who made this graph was thinking about “telling a story,” summarize what you think his story is?
2. Why do you suppose the person who made it put both unemployment rate and weekly earnings in the same graph/picture instead of giving them in different pictures?

Stack Plots: See Figure 5.16 on p. 337 (We already discussed the second figure on that page.)

1. Why is the bar for a private 4-year on-campus college the highest one?
2. Are there any categories in these for which the costs are pretty similar for all the types of schools?
3. Are there any categories in these for which the costs are quite different for all the types of schools?

Graphs of Geographical data: See figures on pages 338-339.

- I’m not suggesting any questions here. Make up some questions for yourself and answer them.

Now, skim over the discussion in the text for these three types of graphs on pages 336 - 339. Do you believe you understand how to answer questions on these types of graphs?

The following examples and discussion is somewhat different. You aren't expected to fully understand all the information in all the graphs on these pages. Each is included for at least one particular reason. My questions below are to guide you to find that reason.

Don't get stuck anywhere here trying to do more with a particular graph than we intend for you to do.

Activity 6. Groups. Pages 340-341. Discuss which graph on p. 340 is really a three-dimensional graph and why? Why is the other one not really a three-dimensional graph?

Activity 7. Groups. Figure 5.22, p. 341. Why do they say that this picture is definitely worth 1000 words? Start to make a list of the different variables that are graphed in this picture. How many can you find? Who in your group can find the most? Can they show you what all they found?

Activity 8. Groups. Figure 5.23, p. 342. What is the misleading about the pictures for comparison?

Activity 9. Groups. Figure 5.24, p. 342. How much did the percentage fluctuate over these years? A lot? Or not so much? Which do you think is a better graph here to illustrate an article about who goes to college?

Activity 10. Groups. Figure 5.25, p. 343. We already learned about logarithms. Explain how the vertical scale in the left-hand graph has something to do with logarithms.

Activity 11. Groups. Percentage change graphs. P. 343 and Figures 5.26 and 5.27 at the top of the next page.

1. What does the percentage change graph (left) suggest to you about which type of college is increasing more in cost? And when?
2. What does the actual cost graph (right) suggest to you about which type of college is increasing more in cost? And when?
3. From the percentage change graph on the left, we see a really high peak for public colleges. When was that and how is it reflected in the actual cost graph?

Activity 12. Groups. Pictographs. Figure 5.28. p. 344. First look at this graph and think about what it says. What information does it convey to you? Is it appealing? Then read what the author of our book says about it. Discuss that with your group. After discussion, what information do you now think this graph would convey to readers? Do you have any suggestions for how the graph might be changed to make it better?