Instructor's Resources

and Solutions Manual

Instructor's Resources and Solutions Manual

to accompany

Eric W. Corty

Using and Interpreting Statistics

A Practical Text for the Behavioral, Social, and Health Sciences

Second Edition

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Instructor's Resources and Solutions Manual
by Laura Edelman
to accompany
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PREFACE

Each chapter in the **Instructor's Resources** to *Using and Interpreting Statistics, second edition* includes a number of useful features.

The **Note to Instructors** points out important concepts to emphasize, specific topics to focus on, and those topics that are most challenging to students. You are also referred to helpful discussions or exercises that are proven effective in communicating the points of the chapter.

The **Outline of Resources** lists the various resources in each chapter. It gives you a broad look at what resources are available and where to locate them within each chapter.

The **Chapter Guide,** which is in outline form, contains a number of useful features, including highlighted key terms from the text and a number of activities and discussions that should create a more engaging and interactive atmosphere for classroom time. Although it's not meant to substitute your reading of the text, it does give you a good overview of what's in the chapter.

- **Discussion Questions:** Each chapter contains a number of discussion questions that are helpful in engaging the students in the topic at hand. Some questions are factual, and others encourage students to consider their own opinions and experiences. You will also find suggested answers to the discussion questions, written to offer you a range of possible responses.

- **Classroom Activities:** Like the discussion questions, these vary in content. Some require students to conduct hands-on experiments that can be statistically analyzed afterward. Others stress interpreting the statistics so students feel more comfortable reading and analyzing psychological research. Handouts and Presentation Slide Masters have been included as well.

Located directly after the Instructor's Resources, the ***Solutions Manual*** consists of solutions to all of the textbook End-of-Chapter Exercises.

1 Introduction to Statistics

NOTE TO INSTRUCTORS

This chapter sets up the fundamental vocabulary of statistics. Students need to be able to identify the three different research designs. In comparing the three designs it is important to emphasize that only the experimental design allows for a clear inference of causality. Both the correlational design and the quasi-experimental design have potential confounds that interfere with casual inferences. Students often have trouble understanding how random assignments protect the experimental design from potential confounds, so it is worth spending some extra time on this. Students need lots of practice to be able to identify whether a variable is being used as an independent or dependent variable and to be able to identify the scale of measurement. The discussion questions and class exercises are designed to give your students a variety of experiences to practice these identifications. Finally, students need to understand how a sample relates to the population and how getting a descriptive statistic from the sample can be used in inferential statistics to make inferences about the population.

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1. Research designs
- Discussion question 1-1 (p. 2)
- Classroom activity 1-1 (p. 2)

2. Independent and dependent variables
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- Classroom activity 1-3 (p. 4)

3. Levels of measurement
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6. Handouts

- Handout 1-1: Identifying independent and dependent variables (p. 6)
- Handout 1-2: Creating experiments with independent and dependent variables (p. 7)
- Handout 1-3: Identifying scales of measurement (p. 8)

CHAPTER GUIDE

1. Research Designs

a) Correlational design is when each participant is measured on two variables and then the relationship between those variables can be assessed. However, correlation does imply causation, and it is important to look for potential **confounding variables.** There are three possible explanations for a correlation:
1) X may cause Y, 2) Y may cause X, or 3) a third variable may influence both X and Y.

b) Experimental design is when participants are **randomly assigned** to different conditions. Random assignment is important because variables that might be potential confounds get randomly distributed to different groups. The use of random assignment allows us to make a causal inference that any differences between the two groups are a result of the difference we set up between the groups.

c) Quasi-experimental designs are when participants are grouped based on a variable that cannot be manipulated. Examples of this type of design are participant variables such as gender or age, or variables that would be unethical or impossible to manipulate such as alcoholism or disaster survivors. Because there is no random assignment, researchers must be especially careful to assess potential confounds.

Discussion question 1-1

Why are there more likely to be confounds in a quasi-experimental design than an experimental design? How does random assignment help to reduce the possibility of confounds?

Your students' answers should include:

- There is no random assignment in a quasi-experimental design. Without random assignment there is the possibility of confounds.
- Random assignment reduces the possibility of confounds by randomly distributing potentially confounding variables between the groups.

Classroom activity 1-1

Instructions

Start by giving the class some research questions (or have them generate their own ideas) For example:
Does the amount of vitamin C you take influence the number of colds you get?
Does ginkgo balboa improve memory?
Does the number of hours of sleep you get the night before a statistics exam influence your exam grade?
Do men raise their hands to answer questions more frequently in class than women?

Have the students get in small groups (2 to 4 students in a group) and ask the group to take one or more of the questions to set it up as a correlational design, an experimental design, and a quasi-experimental design. It is sometimes helpful to give them an example to start with. For vitamin C and colds, for example, a correlational design would be taking a sample and measuring how many units of vitamin C they take per day and how many colds they had in the last six months. An experimental design would be to randomly assign participants to one of two groups. One group takes 200 mg of vitamin C a day for six months, and the other group does not take any vitamin C. At the end of six months, you ask them how many colds they had over the six-month period. A quasi-experimental design would be to ask people if they regularly take vitamin C and those who say yes are in one group and those who say no are in a second group. Again at the end of six months, you ask them how many colds they had.

Have the groups write their research designs on a piece of paper in different orders. Each group should pass their paper to a nearby group. The group that receives the paper should try to identify the designs and indicate how they knew what the design was. Then call on some groups to read out an example to the class of both what the first group wrote and how they were able to identify the design.

2. Independent and dependent variables

a) **Independent variables** are the basis for different groups in an experiment. In an experiment the independent variable is manipulated, and in a quasi-experimental design the independent variable is the basis for grouping but is not manipulated.

b) **Dependent variables** are the measured outcome that depends on which group the participant was in.

c) **ICED** is a useful mnemonic for remembering:
independent = cause and effect = dependent

Discussion question 1-2

My students are always trying to memorize which specific variables are independent and which are dependent. I explain that they need to understand how the variable is used and that the same variable can be used as an independent or dependent variable. Starting with an example of mood, I can use mood as an independent variable—half my participants can read a story about a sad person, and half can read a story about a happy person. I can then test both groups on their recall of the story. In this example mood is the independent variable, and recall is the dependent variable. To make mood the dependent variable, I can play music in the major key to half my participants and music in a minor key to the other half. All participants can rate their mood after listening to music. In this example musical key is the independent variable, and mood is the dependent variable.
Ask the class to generate examples of how the following variables can be used as an independent variable and then as a dependent variable:
human age, impulsivity, reaction time, memory, time perception.

Classroom activity 1-2

Give the students copies of **Handout 1-1** on identifying independent and dependent variables**.** The students can work alone or in small groups to identify the variables. When most of them seem done you can call on people to share their answers and to explain how they decided which variable was independent and which was dependent.

Classroom activity 1-3

Give the students copies of **Handout 1-2.** In small groups of 2 to 4 students they can work to generate hypotheses that use the variables in the specified way (as independent or dependent). Give them 10–15 minutes to work on this and then have groups share some of the examples they generated. This not only reinforces their ability to identify how a variable is being used in an experiment, but it also demonstrates for them that variables can be used in multiple ways.

3. Levels of Measurement

There are four levels of measurement.

- **Nominal** just puts information into categories; they indicate a difference, for example, Gender.
- **Ordinal** provides an order for the categories; they indicate a direction for the difference, for example, socioeconomic status can be divided into upper, middle, and lower income.
- **Interval** measures have equal distances between the levels as well as direction, for example, self-esteem ratings.
- **Ratio** scales have equal distances and an absolute zero. The zero allows meaningful ratios, for example, if we look at the number of days per week a person goes to the gym. A person who does not go to the gym would have a 0, and someone who goes four times a week goes twice as often as someone who goes twice a week.

Students need to be able to distinguish the scales of measurement because different scales of measurement require different statistics.

Discussion question 1-3

Participants are asked to rate the degree to which they agree with raising taxes to fund greater mental health care. The rating is on a 7-point scale, with a 1 being "disagree strongly" and 7 being "agree strongly." *Why can't I say that a person who sets their rating at 4 agrees twice as much as a person who sets their rating at 2?*

Students' answers should include:

- There is no absolute zero, so there are no meaningful ratios.
- Students should also note that a score of 2 represents disagreement, whereas a score of 4 represents agreement.

Discussion question 1-4

Why is it not meaningful to compute the average of nominal data?

Students' answers should include:

- The places between the categories do not have meaning. For example, if republicans are a "1" and democrats are a "2," there is no meaning to an average of 1.3.

Classroom activity 1-4

Give students copies of **Handout 1-3** on identifying scales of measurement. They can work alone or in small groups to identify the level of measurement for each variable. When they have had some time to work on it, you can call on people to share their answers. It is important that students can correct any wrong answers so that the handout can be used as a study aid when preparing for an exam.

4. Population versus sample

a) A population is all the members of the group of interest.

b) Populations can be large, for example, all college students in the United States, or populations can be small, for example, students at your school currently taking a class on astrophysics.

c) Samples are subsets of the population.

d) Most statistics are done using samples because the population of interest is too large to reasonably measure.

Discussion question 1-5

If I wanted to find the typing speed of the average college student, why would I use a sample rather than measuring the typing speed of the entire population?

Students' answers should include:

- It would take too long to test every student, and more people would become students while we were testing, so we could never be done.

5. Descriptive versus inferential statistics

a) Descriptive statistics summarize a set of data. They are often (but not always) done for a sample of data.

b) Inferential statistics use descriptive statistics taken from a sample to make inferences about a population.

Discussion question 1-6

How is the difference between samples and populations related to the difference between descriptive and inferential statistics?

Students' answers should include:

- Descriptive statistics are usually done on samples.
- Inferential statistics use information from samples to make inferences about a population.

HANDOUT 1-1

Independent and Dependent Variables

For each of the following experiments, indicate the independent and dependent variables.

1) Bentley hypothesized that students who had more experience with the Internet would adjust better to the first year of college. He gathered 20 first-year college students, and half maintained their own Web site before coming to college while half had no idea how to build a Web site before college. He compared the GPAs of the two groups.

2) Slotterback & Jones investigated how age influenced attitudes toward the elderly. They had children, teenagers, young adults, and older adults list as many positive things as they could think of about "old people." The number of positive things listed was counted for each participant.

3) Psych Club wants to know the best way to study for the verbal GREs. To help them you set up several study groups. One group reads a novel every month for a year. A second group studies 20 new vocabulary words each month for a year. A third group takes a practice verbal GRE each month for a year, and a fourth group is used as a control. Each participant takes the GRE at the end of the year. Their scores are compared.

4) Reiser investigated the influence of personality on Facebook use. She had 100 students take a personality inventory and divided them into extroverts and introverts. She then had them report how many hours per week they spent on Facebook.

HANDOUT 1-2

Creating Experiments with Independent and Dependent Variables

With your group, design an experiment and state your hypothesis for the experiment in which

a) crowding is an independent variable.

b) ratings of happiness is the dependent variable.

c) reading speed is the dependent variable.

d) reading speed is the independent variable.

HANDOUT 1-3

Measurement Practice

For each of the following, name the scale of measurement (nominal, ordinal, interval, ratio).

1) annual income in dollars

2) top five favorite movies

3) marital status

4) rating degree of enjoyment on a five-point scale

5) zip codes

6) socioeconomic status

7) IQ scores

8) number of parking tickets

9) number of Facebook friends

10) class rank

2 Frequency Distributions

NOTE TO INSTRUCTORS

This chapter shows students how to summarize data by making frequency distributions. Students do not usually have trouble with the difference between ungrouped and grouped frequency distributions, but they often struggle with how to set up a grouped frequency distribution so it is important to spend more time on the grouped distributions. You need to emphasize that the smaller numbers of the scale need to go at the bottom so that the cumulative frequency and cumulative percentage make sense. Some students have trouble with how the frequency *accumulates*. **Figure 2.1** in the text provides an excellent visual example of how the numbers get added up. **Table 2.5** in the text provides students with a good summary of the decisions that need to be made when setting up a frequency distribution. Students can usually find the real limits of whole numbers, but you should provide examples of how to calculate the real limits of numbers with different levels of decimal places. I have provided you with a handout to give them practice. I have also found that students find it difficult to determine whether a scale is discrete or continuous, so they need to see many examples to get a feel for the difference. It is very important that students learn to see the relationship between the frequency distribution and the graphs. Later in the course when we move to using the normal curve model, students seem to forget that the curve represents a frequency distribution. I have provided handouts that will give the students practice going back and forth between the two representations of data. I have also provided materials that allow the students to practice describing the shapes of distributions and showing they know the shape provides useful information.

OUTLINE OF RESOURCES

1. Ungrouped and grouped frequency distributions
- Discussion question 2-1 (p. 10)
- Discussion question 2-2 (p. 11)
- Classroom activity 2-1 (p. 11)

2. Discrete and continuous numbers
- Classroom activity 2-2 (p. 12)

3. Real limits of numbers
- Discussion question 2-3 (p. 12)
- Classroom activity 2-3 (p. 12)

4. Three types of graphs
- Discussion question 2-4 (p. 13)
- Classroom activity 2-4 (p. 13)

5. Describing the shapes of distributions
- Discussion question 2-5 (p. 13)
- Classroom activity 2-5 (p. 14)
- Classroom activity 2-6 (p. 14)

6. Handouts
- Handout 2-1: Making and comparing frequency distributions (p. 15)
- Handout 2-2: Identifying discrete and continuous numbers (p. 16)
- Handout 2-3: Computing the real limits of numbers (p. 17)
- Handout 2-4: Graphing frequency distributions and graph paper (p. 18)
- Handout 2-5: Interpreting graphs (pp. 19–21)

7. PowerPoint slide template
- Slide 2-1: Kurtosis and variability (p. 22)

CHAPTER GUIDE

1. Ungrouped and grouped frequency distributions

a) Ungrouped frequency distributions can be used when the data take on only a few values. Grouped frequency distributions are used when the variable takes on many values and the full distribution cannot fit on a single page.

b) Frequency distributions need to have a clear title and labeled columns.

c) The first column has the values of the variable, the next column is the frequency, the cumulative frequency, then percentage, and the cumulative percentage. Not all of the columns are required.

Discussion question 2-1

Why is it the number of values of the variable and NOT the number of cases that determines whether you used an ungrouped or a grouped frequency distribution?

Your students' answers should include:
- The number of values determines how many groups there are, but there can be many cases within a single group. Each row in the distribution represents a different group, and you can only view a limited number of rows at a time.

Discussion question 2-2

Why do we start with the lowest values of the variable at the bottom of a frequency distribution?

Your students' answers should include:

- So that the cumulative frequency adds up to the total number of cases at the top of the distribution.
- So that the cumulative percentage equals 100 at the top of the distribution.

Classroom activity 2-1

The goal of this activity is to have students practice making ungrouped and grouped frequency distributions. Additionally, by having different students make different distributions from the same data and then comparing the distributions, students can learn about how their choices about the distribution will influence how well others can understand the distribution and what the distribution communicates about the data.

Instructions

There are five different data sets on **Handout 2-1**. Have students work in teams (pairs or if you have a large class you can use groups of 3 to 4). For each data set, you need five teams of students. Team one makes an ungrouped distribution of the data. Team two makes a grouped distribution with an interval size of 2. Team three makes a grouped distribution with an interval size of 5, team four uses an interval size of 10, and team five uses an interval size of 20. You can expand this to use a greater variety of interval sizes depending on the size of the class. You may also want to eliminate some of the obviously bad choices, for example, use an interval size of 20 when the data go from 1 to 20, or doing an ungrouped distribution when the range of the data is 100 values. Each data set is designed to have a different optimal interval size. Once students have finished creating their distributions, you can have the class compare the five (or more) versions for each data set and discuss which version is best and why. Students should discover that too small an interval does not reduce the data enough and that too large an interval loses too much information.

The following table shows the different groups for this activity:

	Interval Size				
Data Set	Ungrouped	2	5	10	20
A	Team 1	Team 2	Team 3	Team 4	Team 5
B	Team 6	Team 7	Team 8	Team 9	Team 10
C	Team 11	Team 12	Team 13	Team 14	Team 15
D	Team 16	Team 17	Team 18	Team 19	Team 20

2. Discrete and continuous numbers

a) Discrete numbers can only take on whole values.

b) Continuous numbers can take on decimal values.

Classroom activity 2-2

Give the students copies of **Handout 2-2** on identifying discrete and continuous numbers. The students can work alone or in small groups to identify which variables are going to result in discrete numbers and which in continuous numbers. When most of them seem done you can call on people to share their answers and to explain how they decided which was discrete and which was continuous.

3. Real limits of numbers

In continuous data the real limits of a number are half a unit above and half a unit below the stated value.

Discussion question 2-3

Why do we compute the real limits of continuous numbers but not discrete numbers?

Your students' answers should include:

- Only continuous numbers can take on decimal values.
- We assume that with more sophisticated measuring devices we could get more precise measurements that would include more decimal places.
- The real limits imply that given our current measurement the "real value" of the number could be within a half a unit above or below the measured value.

Classroom activity 2-3

Give students copies of **Handout 2-3** on determining the real limits of data at different levels of precision. They can work alone or in small groups to identify the real limits of each number. When they have had some time to work on it, you can call on people to share their answers. It is important that students can correct any wrong answers so that the handout can be used as a study aid when preparing for an exam.

4. Three different types of graphs

a) Graphs are another way to represent distributions of data. Many people find a graph easier and faster to interpret than a frequency distribution.

b) Bar graphs are used when you have discrete data. In bar graphs the bars do not touch each other to represent that the data are discrete.

c) Histograms can be used to represent continuous data. In a histogram the bars touch each other and start and end at the real limits to indicate that the data is continuous.

d) Frequency polygons can also be used to represent continuous data. The frequency polygon (or line graph) has dots at the frequency of the midpoint of each interval. The dots are then connected by lines.

Discussion question 2-4

Why do the bars in some bar graphs touch but the bars in other bar graphs do not touch? What does this tell us about the data?

Your students' responses should include:

- When the bars do not touch it means the numbers are discrete.
- When the bars touch it means the numbers are continuous.

Classroom activity 2-4

Give each student a copy of **Handout 2-4** and a copy of the graph paper. Students can work in pairs or alone. There are three frequency distributions on the handout. Students should make a bar graph of the first distribution, which has discrete values. They should make a histogram for the second and a frequency polygon (line graph) for the third distribution, both of which have continuous data. Remind students to create careful labeling and to provide titles. When students have finished, they can swap graphs with a neighbor, and they can give each other feedback on the graphs, pointing out any errors or omissions. It would be helpful to get a good version of each graph to show to the class as a whole and to point out what makes a good graph. The bullet points on pages **52** (histogram) and **54** (frequency polygon) of the textbook provide a checklist for the qualities of a good graph.

5. Describing the shapes of distributions

a) The shapes of distributions can vary on three factors: modality, skew, and kurtosis.

b) Modality refers to the number of peaks in distribution, unimodal is one peak, bimodal is two peaks, and three or more peaks is called multimodal.

c) Skew refers to the symmetry of the distribution. If the distribution is symmetric it is said to have no skew. If the peak of the data is toward the right with a shallow tail toward the left, this is called a negative skew (the tail points to the negative numbers). If the peak of the data is toward the left with a shallow tail toward the right, this is called a positive skew (the tail points to the positive numbers).

d) Kutosis is the degree to which the distribution is peaked. A normal distribution with a rounded high point is called mesokurtic, a sharp peak is called leptokurtic, and a flat distribution is called platykurtic. If you want students to remember these names a useful mnemonic is that platykurtic is flat like a plateau, leptokurtic provides a nice sharp peak that you could leap off of to go gliding, and meso is in the middle.

Discussion question 2-5

If the distribution is skewed to the right, do most of the cases have higher numbers or lower numbers? Does the tail represent most of the data?

Your students' answers should include:

- In a right-skewed distribution, most of the cases have lower numbers because most of the data is to the left.
- The tail represents data values with few cases.

Classroom activity 2-5

We will see that kurtosis is related to variability. Look at the first graph on ***Slide 2-1*** (provided on page 22). *Do most of the participants have very similar scores, or do lots of people have different scores? Now look at the second graph on* ***Slide 2-1****. Does this distribution have more or less variability than the first one? Why?*

Your students' answers should include:

- The first graph is leptokurtic so most of the people have the same score.
- Only a few people had different scores.
- The second graph is platykurtic, so the scores are very spread out. There are many people at different values on the graph.

Classroom activity 2-6

Many students have trouble interpreting graphs, so this is a good time to start learning how to interpret graphical representations of data. **Handout 2-5** has descriptions of several experiments and graphs of the data from the experiments. Have students get into small groups to discuss what the graphs tell them about the results of the experiments. When they are done, ask students to share their answers.

Answer key:

- Graph 1 shows the results of having men and women do a mental rotation task.
- The graph is bimodal because there is a gender difference in that men tend to score better than women. There is also a very wide range of scores indicating that some people are very good and some are very bad at this task.
- Graph 2 shows the results of asking psychology majors how many mathematics classes they have taken in college. The graph is leptokurtic and positively skewed because most psychology majors take one or two math classes but a few will take many more.
- Graph 3 shows the results of asking students their favorite color. The graph is platykurtic because there are an almost equal number of cases for each color.
- Graph 4 shows the grades on a first statistics exam. The graph is negatively skewed because most students did fairly well but a few did very poorly.

HANDOUT 2-1

Making and Comparing Frequency Distributions

Use the following data sets to make a frequency distribution. Each team should use a different interval size. Your instructor will tell you which data set to use and which interval size. When you are done, compare your results with the results of other teams who used the same data set. Which interval size worked best for your data set? Why?

DATA SET A

7,1,7,6,8,17,3,4,7,6,17,2,7,8,7,17,15,7,20,16,17,18,3,17,6,7,8,12,17,17,14,12,17,19,20,7,17,3, 15,7

DATA SET B

1,12,20,13,14,16,15,17,19,18,10,16,19,15,17,16,14,2,12,15,17,20,14,18,13,16,9,18,15,14, 12, 19,17,13,3,16,14,15,18,20,12,4,17,19,13,16,15

DATA SET C

99,5,86,55,97,82,13,44,32,91,88,68,72,75,25,35,48,100,94,86,80,84,77,91,88,94,83,87,91, 51,82,90,33

DATA SET D

22,10,22,5,22,30,22,41,50,22,1,22,2,17,22,45,22,25,32,22, 25,22,21,15,22,9,7,5,22,11,14, 22,18, 16, 22, 20,21,22,26,19,18,22,27,22

HANDOUT 2-2

Identifying Discrete and Continuous Numbers

For each variable, identify whether the measurement is most likely to result in discrete or continuous data.

1. annual income in dollars _____

2. top five favorite movie _____

3. marital status _____

4. rating degree of enjoyment on a five-point scale _____

5. zip codes _____

6. socioeconomic status _____

7. IQ scores _____

8. number of parking tickets _____

9. number of Facebook friends _____

10. class rank _____

11. degree of extroversion on a 20-point scale _____

HANDOUT 2-3

Computing the Real Limits of Numbers

The real limits of numbers are one-half unit above and below the stated number.
For the number 10, for example, the real limits are 9.5 and 10.5.
For the number 10.6, the real limits are 10.55 and 10.65.
For the number 10.77, the real limits are 10.765 and 10.775.

Helpful hint: The real limits always have an extra decimal place.

Find the real limits of

1) 27

2) 14.2

3) 135.44

4) 0

5) –2.6

6) 15567.2

7) 1.1

8) 5.65554

HANDOUT 2-4

Graphing Frequency Distributions

Following the guidelines on pages 51 and 52 of your textbook, make a bar graph of the following frequency distribution.

X	*f*
8	9
7	12
6	10
5	8
4	6
3	2
2	1
1	1

Following the guidelines on page 52 of your textbook, make a histogram for the following distribution.

X	*f*
79.5–89.5	5
69.5–79.5	15
59.5–69.5	6
49.5–59.5	7
39.5–49.5	6
29.5–39.5	15
19.5–29.5	4
9.5–19.5	4

Following the guidelines on page 54 of your textbook, make a frequency polygon (line graph) for the following distribution.

X	*f*
35.5–40.5	4
30.5–35.5	5
25.5–30.5	0
20.5–25.5	6
15.5–20.5	7
10.5–15.5	8
5.5–10.5	6
0.5–5.5	4

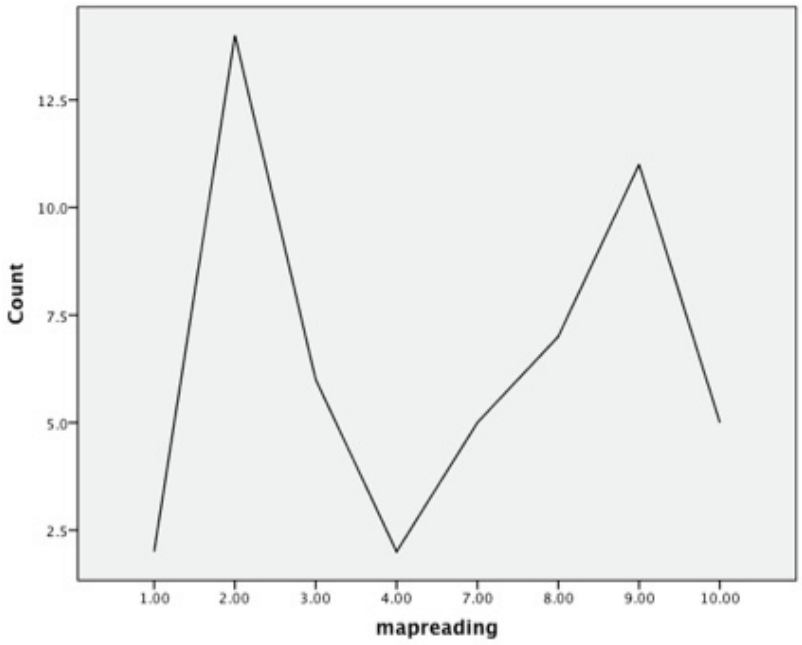
HANDOUT 2-5

Interpreting Graphs

Each of the following examples provides a description of the source of the data and then a graph of the resulting data. Describe the shape of each graph in terms of modality, skew, and kurtosis. Then explain what the graph tells you about the data. Interpret the graph in terms of the source of the data.

Graph A

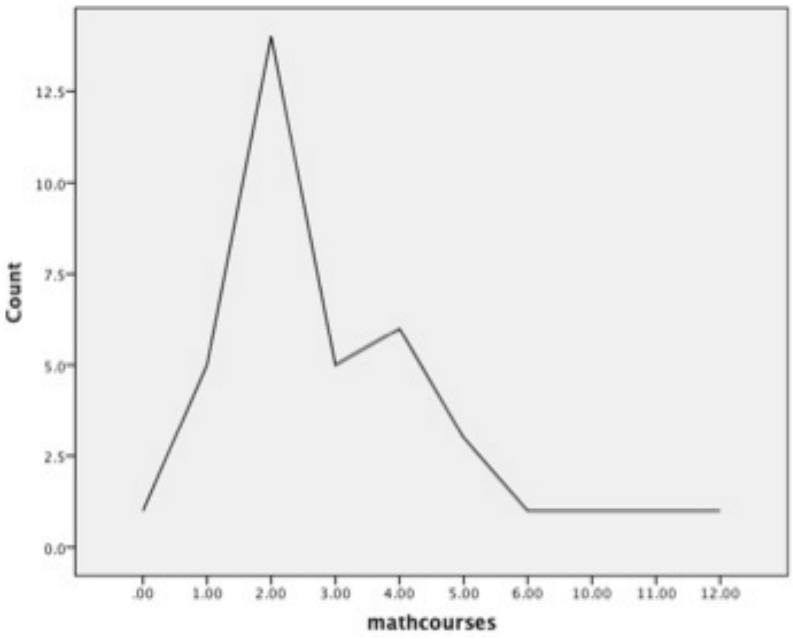
People were asked to do a series of map reading tasks. The scores are graphed below. What does this graph tell you about people's map reading abilities?



[2A]

Graph B

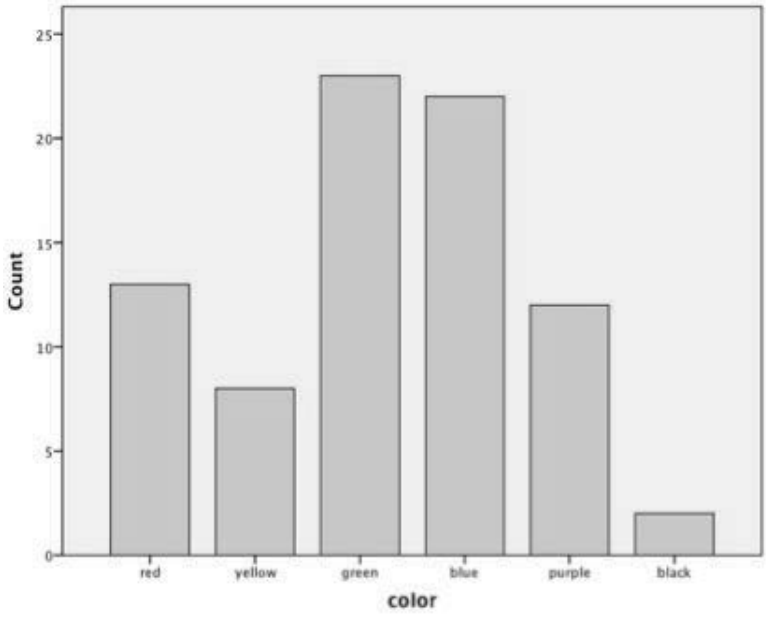
Psychology majors were surveyed to find out how many mathematics classes they have taken in college. The results are graphed below. What does this graph tell you about psychology majors taking math courses?



[2B]

Graph C

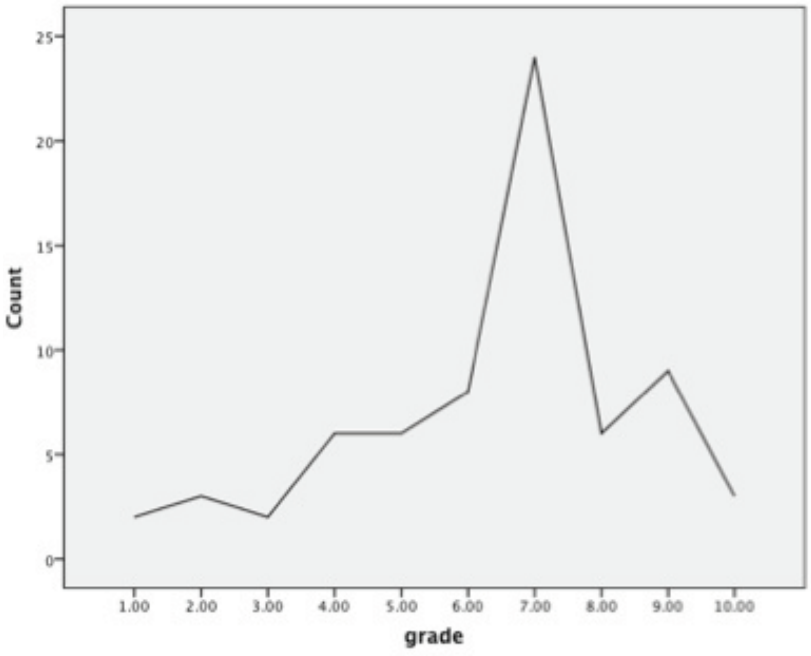
College students were asked to indicate their favorite color. The results are presented in a bar chart below. What does this chart tell you about color preferences?



[2C]

Graph D

A statistics professor made a graph of the grades on the first statistics exam. What does this tell you about the first exam? Why would this graph be useful for students in the class?



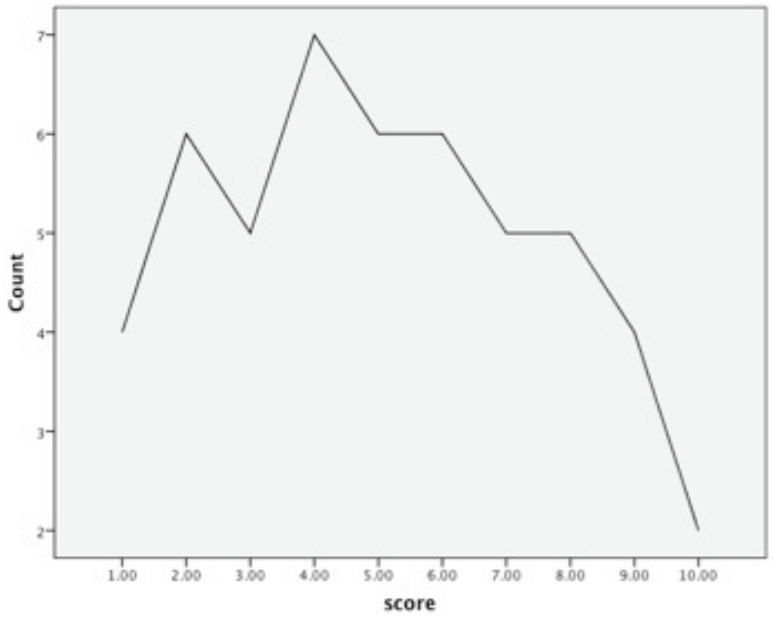
[2D]

POWERPOINT SLIDE 2-1

Kurtosis and Variability

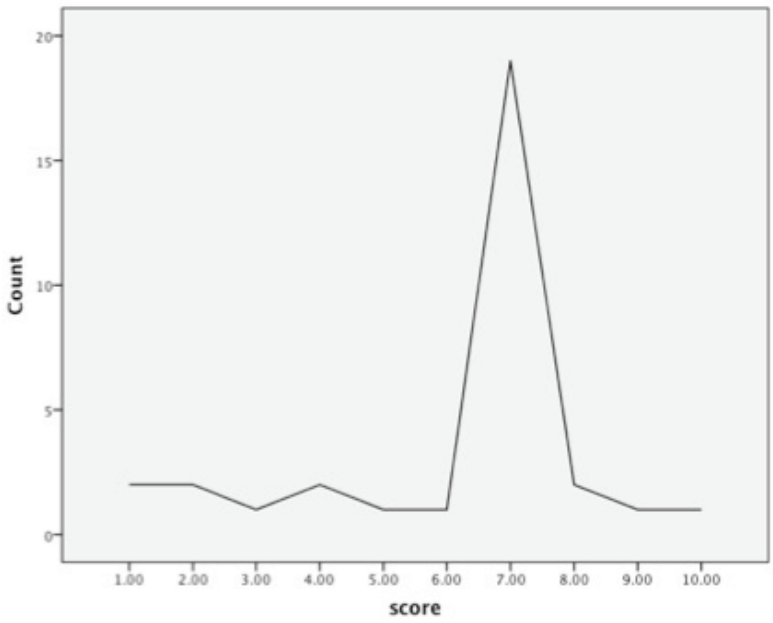
Compare the two graphs. In which graph do the scores vary more?

Graph A



[2E]

Graph B



[2F]

3 Measures of Central Tendency and Variability

NOTE TO INSTRUCTORS

In this chapter students learn how to summarize a set of data by using a measure of central tendency and a measure of variability. Three measures of central tendency are presented. Students usually have no trouble calculating these, but you need to give them practice learning which measure to use. Variability is a critical concept in statistics. If scores did not vary, we would not need to do statistics. Variability is going to play a major role in all future statistical formulas, so students need to be very clear on both what variability means and how to calculate it. The jellybean jar example on page 88 in the textbook provides a vivid example of why we expect less variability in a sample than in a population. I have provided more numerical examples for students to see. Additionally, I have provided resources that provide students with practice interpreting measures of central tendency and variability.

OUTLINE OF RESOURCES

1. Define and calculate three measures of central tendency and choose the correct measure for a set of data
- Discussion question 3-1 (p. 24)
- Discussion question 3-2 (p. 24)
- Classroom activity 3-1 (p. 25)
- Classroom activity 3-2 (p. 25)
- Classroom activity 3-3 (p. 25)

2. Define variability
- Discussion question 3-3 (p. 25)

3. Calculate the range and interquartile range
- Discussion question 3-4 (p. 26)
- Discussion question 3-5 (p. 26)
- Classroom activity 3-4 (p. 26)

4. Calculate the variance and standard deviation for a population and a sample
- Discussion question 3-6 (p. 27)
- Discussion question 3-7 (p. 27)
- Discussion question 3-8 (p. 27)
- Discussion question 3-9 (p. 27)
- Discussion question 3-10 (p. 27)
- Classroom activity 3-5 (p. 27)