2 Frequency Distributions

NOTE TO INSTRUCTORS

This chapter shows students how to summarize data by making frequency distributions. Students do not usually have trouble distinguishing between ungrouped and grouped frequency distributions, but they often struggle with understanding 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 must go at the bottom so that the cumulative frequency and cumulative percentage will make sense. Some students have trouble understanding 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 that will give them a chance to practice. In my experience, students find it difficult to determine whether a scale is discrete or continuous; 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, you may find that the 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 that they know that the shape provides useful information.

OUTLINE OF RESOURCES

1. **Ungrouped and grouped frequency distributions**
   - Discussion question 2-1 (p. 11)
   - Discussion question 2-2 (p. 11)
   - Classroom activity 2-1 (p. 12)

2. **Discrete and continuous numbers**
   - Classroom activity 2-2 (p. 13)

3. **Real limits of numbers**
   - Discussion question 2-3 (p. 13)
   - Classroom activity 2-3 (p. 13)

4. **Four different types of graphs**
   - Discussion question 2-4 (p. 14)
   - LaunchPad Statistical Applets – One-Variable Statistical Calculator (p. 14)

- Classroom activity 2-4 (p. 14)

5. Describing the shapes of distributions

- Classroom activity 2-5 (p. 14)
- Discussion question 2-5 (p. 15)
- Classroom activity 2-6 (p. 15)
- Classroom activity 2-7 (p. 15)

6. LaunchPad Video Resources

7. Handouts

- Handout 2-1: Making and comparing frequency distributions (p. 17)
- Handout 2-2: Identifying discrete and continuous numbers (p. 18)
- Handout 2-3: Computing the real limits of numbers (p. 19)
- Handout 2-4: Graphing frequency distributions and graph paper (p. 20)
- Handout 2-5: Interpreting graphs (pp. 21–22)

8. PowerPoint slide template

- Slide 2-1: Kurtosis and variability (p. 23)

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 four 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 your 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 use 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 groups 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, which 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. Four 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 are 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.

e) A **stem-and-leaf display** is a graph that displays all the data points of a single variable both numerically and visually. It displays the same information as a histogram—just in a different way and with more detail, combining aspects of a frequency table with a graph. To create a stem-and-leaf display, first create the "stem" by writing down the first digit for each number of your data from highest to lowest. The "leaves" consist of the last digit for each score and are added in ascending order.

Discussion question 2-4

Why do the bars in some bar graphs touch but not in other bar graphs? 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.

LaunchPad Statistical Applets – One-Variable Statistical Calculator
This applet calculates standard numerical statistics (e.g., mean, standard deviation, quartiles) and shows graphical displays (a histogram and a stemplot) of one-variable data sets. You can choose to view data sets from the textbook, or enter your own set of data.

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 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 the class as a whole and to point out what makes a good graph. The bullet points on pages **56** and **57** (histogram) and **58** (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) Kurtosis 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 to help students remember these names, here are some mnemonics you might find useful: 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.

e) The normal distribution refers to a bell-shaped, symmetrical, and unimodal frequency distribution; it is sometimes referred to as the bell curve.

Classroom activity 2-5
In this exercise, you will work with one set of data and compare how the different visualization methods capture the data. You could collect any sort of information from your students, perhaps using the data that you collected earlier to demonstrate different measurement scales, (e.g., height, year in school, age, etc.) and then demonstrate how frequency table, grouped frequency table, histogram, and so forth, might be used to visualize the data.

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 are to the left.
- The tail represents data values with few cases.

Classroom activity 2-6
We will see that kurtosis is related to variability. Look at the first graph on ***Slide 2-1*** (provided on page 24). *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 2-7
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 A 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 B 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 C 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 D 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.

6. LaunchPad Video Resources

- Snapshots: Data and Distributions
- StatClips Examples: Exploratory Pictures for Quantitative Data, Example A
- StatClips Examples: Summaries and Pictures for Categorical Data, Examples A and B
- StatClips: Summaries and Pictures for Categorical Data

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 55 and 56 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 pages 56 and 57 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 pages 57 to 60 of your textbook, make a frequency polygon (line graph) for the following distribution.

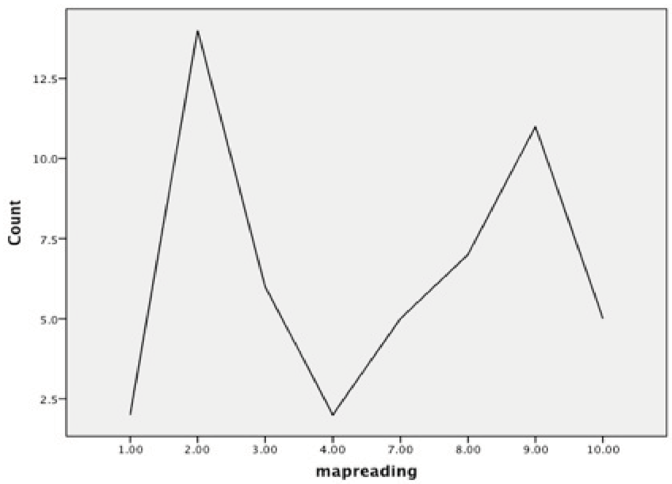
X	f
35.5–40.5	4
30.5–35.5	5
25.5–30.5	0
20.5–25.5	6
15.5–20.5	7
10.5–15.5	8
5.5–10.5	6
0.5–5.5	4

HANDOUT 2-5

Interpreting Graphs

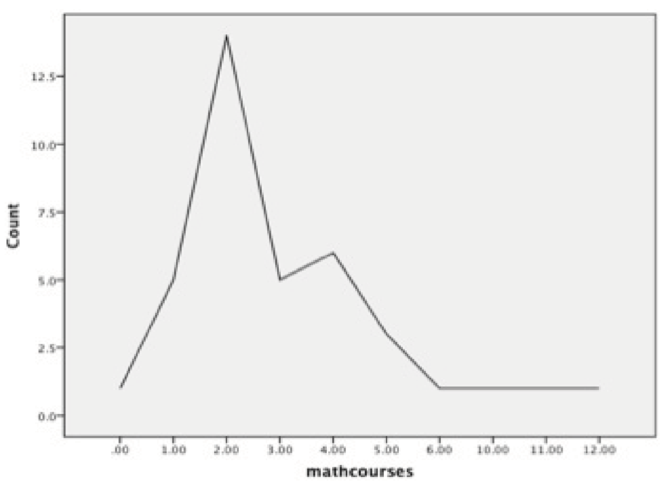
Each of the following examples provides a description of the source of the data and then a graph of the resulting data. Describe the shape of each graph in terms of modality, skew, and kurtosis. Then explain what the graph tells you about the data. Interpret the graph in terms of the source of the data.

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



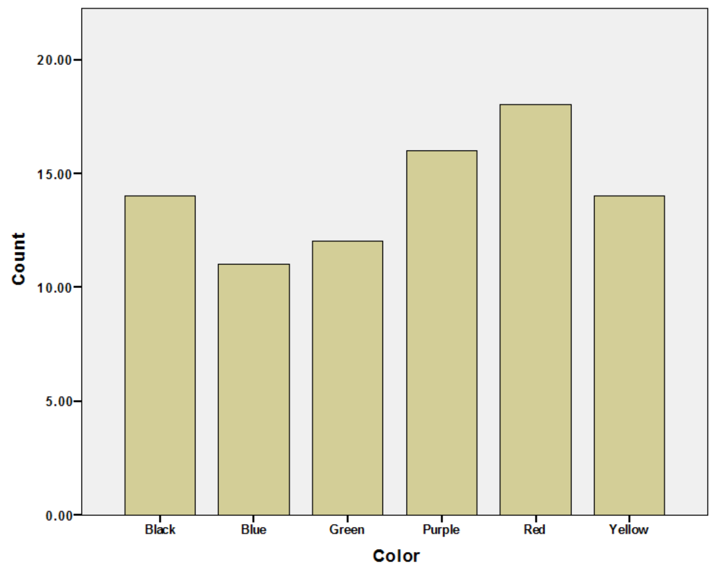
[2A]

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?



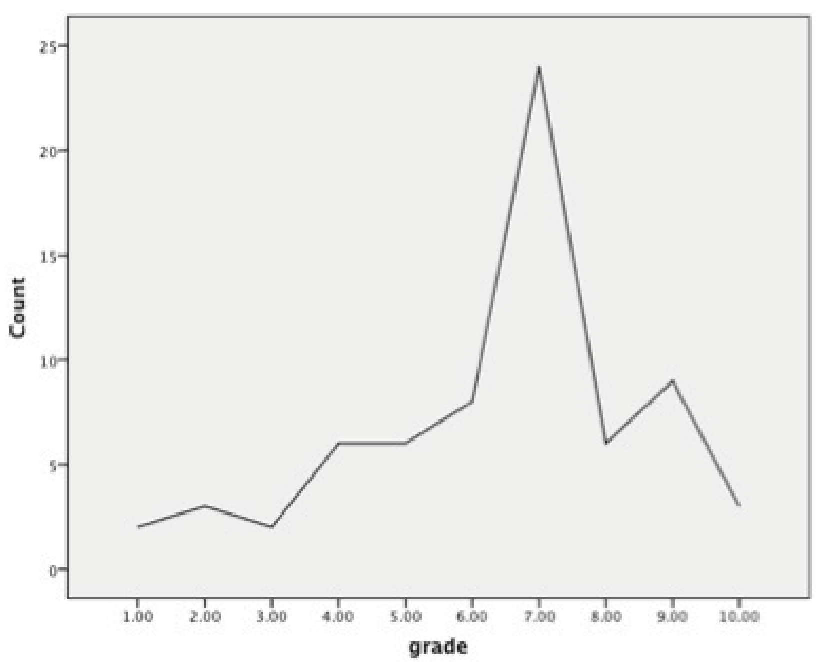
[2B]

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?

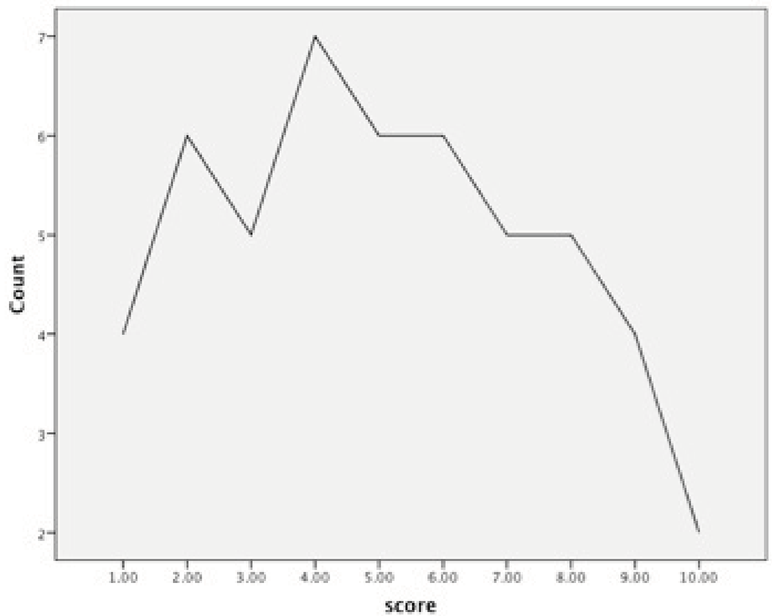


[2D]

POWERPOINT SLIDE 2-1

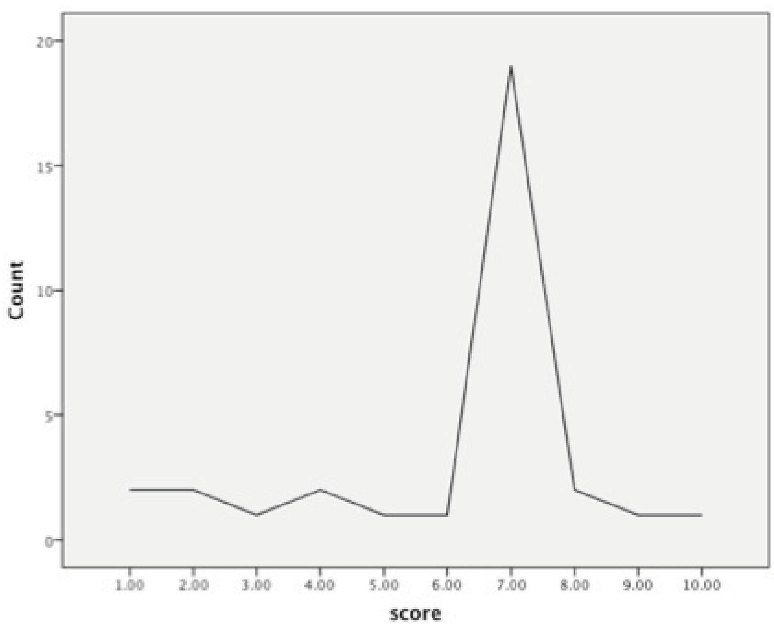
Kurtosis and Variability – *Compare the two graphs. In which graph do the scores vary more?*

Graph A



[2E]

Graph B



[2F]

SOLUTIONS MANUAL

Solutions to End-of-Chapter Exercises

Chapter 1

1.01 summarize
1.02 variables
1.03 cases
1.04 manipulated (controlled)
1.05 (a) X causes Y; (b) Y causes X; (c) some other variable (Z or a confounding variable) causes both X and Y.
1.06 a confounding variable
1.07 random assignment
1.08 independent (or explanatory)
1.09 dependent variable (or outcome variable)
1.10 cause and effect or causality
1.11 groups
1.12 experimental; correlational
1.13 independent = cause; effect = dependent
1.14 outcome; an experimental (or quasi-experimental) study
1.15 grouping
1.16 more
1.17 NOIR
1.18 same vs. different
1.19 ordinal
1.20 equality of units
1.21 arbitrary; absolute
1.22 ratio
1.23 population
1.24 subset
1.25 statistic; parameter
1.26 Latin; Greek
1.27 descriptive; inferential
1.28 X; N; Σ
1.29 two
1.30 four
1.31 (a) Do metal and plastic handcuffs differ in how much abrasion they cause?
(b) Type of handcuff is the explanatory variable; amount of abrasion is the outcome variable.
(c) Experimental
(d) N/A
1.32 (a) Does black paint under the eye improve vision?
(b) Color of paint is the explanatory variable; reaction time is the outcome variable.
(c) Experimental
(d) N/A
1.33 (a) Are "conscientious" students smarter than "nonconscientious" students?
(b) Type of student (conscientious vs. nonconscientious) is the explanatory variable; IQ is the outcome variable.
(c) Quasi-experimental
(d) Socioeconomic status may be a confounding variable. Richer students may be able to afford to be conscientious (to buy all the books, not to have to work so they have more time for studying) and richer students may have gone to better schools, received a better education, and ended up with a higher IQ.
1.34 (a) Does childhood empathy predict adult mental health?
(b) Childhood empathy is the explanatory variable; adult mental health is the outcome variable.
(c) Correlational
(d) Parenting style could be a confounding variable. Different parenting styles could lead to both more empathetic kids and mentally healthier adults.
1.35 (a) Are a country's wealth and its greenhouse gas production related?
(b) GDP is the explanatory variable; tons of CO_2 produced is the outcome variable.
(c) Correlational
(d) Population could be a confounding variable. Over the last 50 years, as there were more people in the country, there would be more people to produce and consume goods, increasing both GDP and greenhouse gases.
1.36 (a) Does a child's behavior affect how much he or she receives in presents?
(b) Type of child (naughty vs. nice) is the explanatory variable; monetary value of presents is the outcome variable.
(c) Quasi-experimental
(d) Parenting style can be a confounding variable. Type of parent can affect both how the child behaves and how much the parents spend on presents.

1.37 (a) Does type of information received affect voting behavior?
(b) Type of information (none vs. positive vs. negative) is the explanatory variable; voting for or against is the outcome variable.
(c) Experimental
(d) N/A

1.38 (a) Is there a relationship between protein plaques and short-term memory?
(b) Amount of protein in spinal fluid is the explanatory variable; percentage of words recalled is the outcome variable.
(c) Correlational
(d) Diet is a confounding variable. Different diets might affect both how much protein one has and one's mental abilities.

1.39 Nominal
1.40 Ordinal
1.41 Ordinal
1.42 Ratio
1.43 Interval
1.44 Ratio
1.45 Ordinal
1.46 Interval
1.47 Nominal
1.48 Interval
1.49 (a) Sample
(b) Parameters
(c) Inferential
1.50 Inferential
1.51 Parameter
1.52 Population
1.53 $N = 6$
1.54 $\Sigma X = 8 + 9 + 5 + 4 + 7 + 8 = 41.00$
1.55 $\Sigma X^2 = 8^2 + 9^2 + 5^2 + 4^2 + 7^2 + 8^2 = 299.00$
1.56 $\Sigma X - 1 = (8 + 9 + 5 + 4 + 7 + 8) - 1 = 40.00$
1.57 $\Sigma X = 13 + 18 + 11 = 42.00$
1.58 $\Sigma X^2 = 13^2 + 18^2 + 11^2 = 614.00$
1.59 $\dfrac{\Sigma X}{N} = \dfrac{(13 + 18 + 11)}{3} = \dfrac{42.0000}{3} = 14.00$
1.60 $\Sigma(X - 14) = (13 - 14) + (18 - 14) + (11 - 14) = 0.00$
1.61 12.68
1.62 189.99
1.63 121.01
1.64 674.06
1.65 22.47
1.66 37.98
1.67 2.53
1.68 100.00
1.69 c: *X* causes *Y*.
1.70 e: none of the above
1.71 (a) Do higher levels of physical distress in cities lead to higher levels of social distress?
(b) Amount of graffiti (high, moderate, or low) is the explanatory variable, and teenage pregnancy rate is the outcome variable.
(c) quasi-experimental
(d) The proportion of the city population that has a high school degree could be a confounding variable. Less-educated teenage girls may be more likely to get pregnant. City residents who have not completed high school may be less likely to be employed and more likely to deface property.
1.72 Interval, if one considers this a measure of fears in general; ratio, if one considers it only to be measuring how many of these 10 fears a person has.

Chapter 2

2.01 count
2.02 grouped; ungrouped
2.03 values; frequencies
2.04 Cumulative frequency
2.05 f_c
2.06 100%
2.07 nominal
2.08 cumulative percentage
2.09 grouped
2.10 five; nine
2.11 details
2.12 width
2.13 midpoint
2.14 midpoint
2.15 how many
2.16 whole
2.17 nominal; ordinal
2.18 Continuous
2.19 in-between (fractional)
2.20 continuous number
2.21 interval; ratio
2.22 continuous; discrete
2.23 range
2.24 real limits
2.25 the interval width

2.26 continuous; discrete
2.27 bar graph
2.28 histogram; frequency polygon
2.29 wider; tall
2.30 axes
2.31 *Y*
2.32 *X*
2.33 touch
2.34 midpoint
2.35 nominal
2.36 normal curve (normal distribution)
2.37 modality; skewness; kurtosis
2.38 Modality
2.39 bimodal
2.40 skewed
2.41 negative
2.42 peaked; flat
2.43 ungrouped
2.44 stems; leaves
2.45 Don't forget a title!

Frequency Distribution for Number of Psychiatric Diagnoses in 45 Residents of a Psychiatric Hospital

Number of Diagnoses	Frequency	Cumulative Frequency	Percentage	Cumulative Percentage
5	1	45	2.22	100.00
4	2	44	4.44	97.78
3	9	42	20.00	93.33
2	19	33	42.22	73.33
1	12	14	26.67	31.11
0	2	2	4.44	4.44

2.46

Frequency Distribution for Stage of Moral Development for 516 College Students

Stage of Moral Development	Frequency	Cumulative Frequency	Percentage	Cumulative Percentage
VI	88	516	12.05	100.00
V	112	428	21.71	82.95
IV	187	316	36.24	61.24
III	78	129	15.12	25.00
II	34	51	6.59	9.88
I	17	17	3.29	3.29

2.47

Grouped Frequency Distribution for Number of Chairs in 41 College Classrooms (Interval Width = 20)

Number of Chairs	Interval Midpoint	Frequency	Cumulative Frequency	Percentage	Cumulative Percentage
90–109	99.50	1	41	2.44	100.00
70–89	79.50	1	40	2.44	97.56
50–69	59.50	11	39	26.83	95.12
30–49	39.50	17	28	41.46	68.29
10–29	19.50	11	11	26.83	26.83

2.48

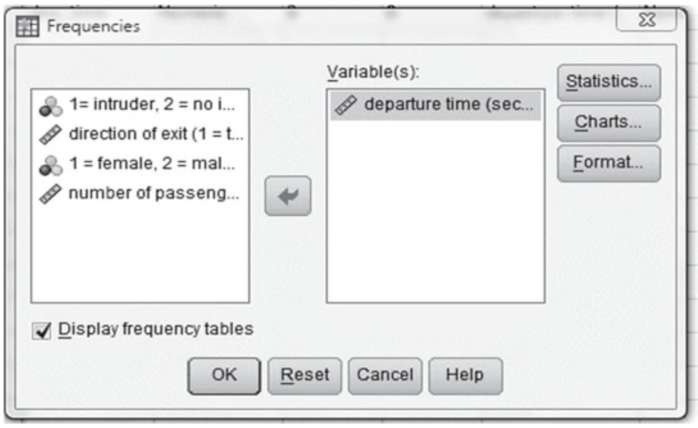
Grouped Frequency Distribution for Expected GPA for 30 First-Semester College Students (Interval Width = 0.50)

Expected GPA	Interval Midpoint	Frequency	Cumulative Frequency	Percentage	Cumulative Percentage
3.6–4.0	3.8	9	30	30.00	100.00
3.1–3.5	3.3	8	21	26.67	70.00
2.6–3.0	2.8	9	13	30.00	43.33
2.1–2.5	2.3	4	4	13.33	13.33

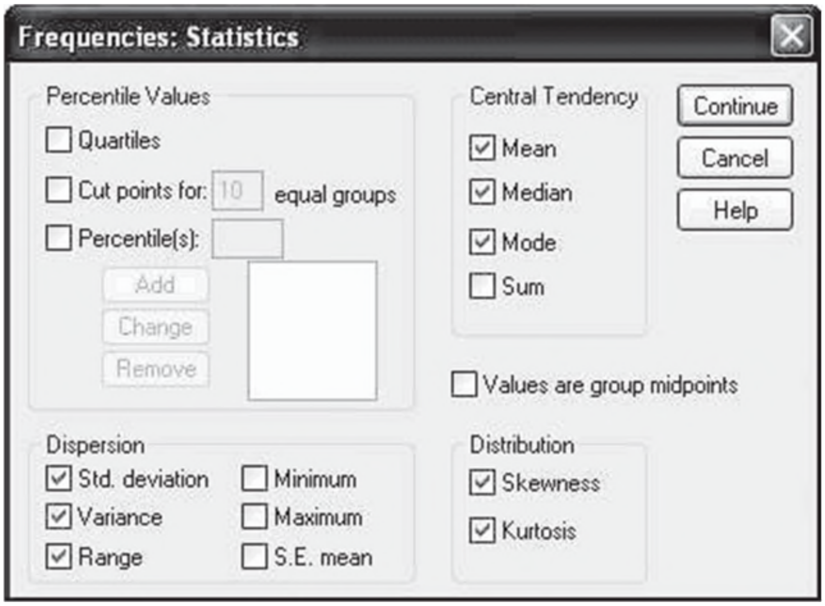
Central Tendency and Variability

Open the dataset Parking Data (Spring.2004).sav. This is the dataset that will be used in the next exercise.

From the **Analyze** menu, select **Descriptive Statistics** □ **Frequencies....** When the **Frequencies** dialog window appears, select departure time and move this variable into the **Variable(s): field** as shown:

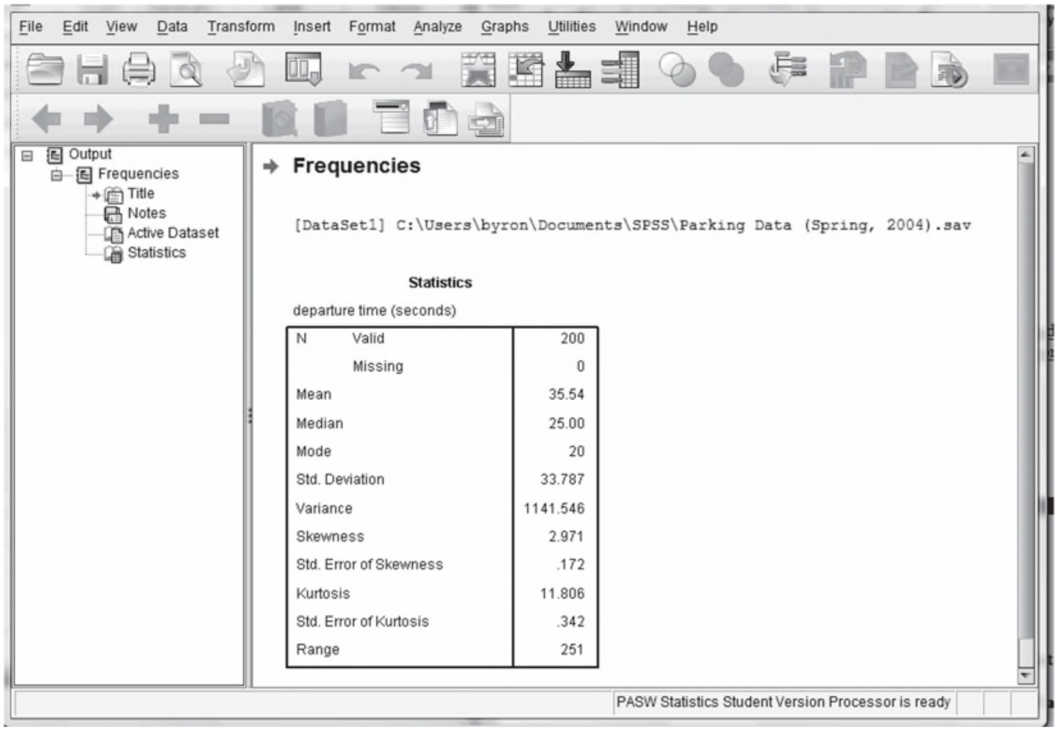


Click on the **Statistics...** tab to open the **Frequencies: Statistics** dialog window. Find the **Central Tendency** section and select **Mean**, **Median**, and **Mode**, then locate the **Dispersion** section and select **Std. deviation**, **Variance**, and **Range**. Finally, under **Distribution** select **Skewness** and **Kurtosis** before clicking **Continue** to return to the **Frequencies** window.



Click **Continue** to return to the Frequencies window and then deselect the **Display Frequency** tables option. Once this is done, select the **OK** button to display results.

The results should look as follows:



Questions

1. Explain how the sign of the **Skewness** statistic may be predicted by comparing the values of the **Mean**, the **Median**, and the **Mode**.
2. What is the relationship between the **Std. Deviation** and the **Variance**?

ANSWERS

1. In all positively skewed distributions, the value of the mean exceeds that of the median, whereas in all negatively skewed distributions, the value of the median exceeds that of the mean.
2. The standard deviation is the square root of the variance.

Statistics

Math_anxiety

N	Valid	87
	Missing	0
Percentiles	25	4.00
	50	6.00
	75	8.00

Math_anxiety

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	2	2.3	2.3	2.3
	1	3	3.4	3.4	5.7
	2	6	6.9	6.9	12.6
	3	6	6.9	6.9	19.5
	4	10	11.5	11.5	31.0
	5	11	12.6	12.6	43.7
	6	12	13.8	13.8	57.5
	7	15	17.2	17.2	74.7
	8	14	16.1	16.1	90.8
	9	2	2.3	2.3	93.1
	10	6	6.9	6.9	100.0
	Total	87	100.0	100.0	