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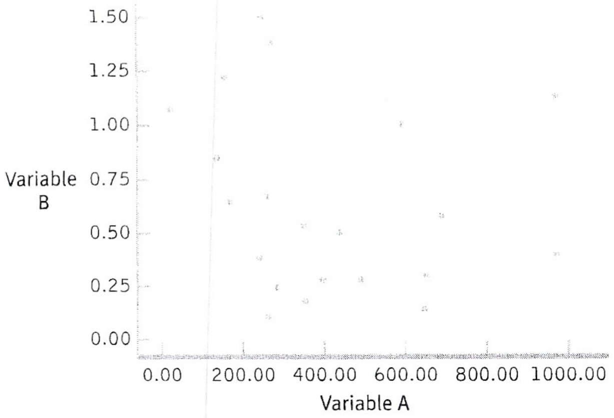
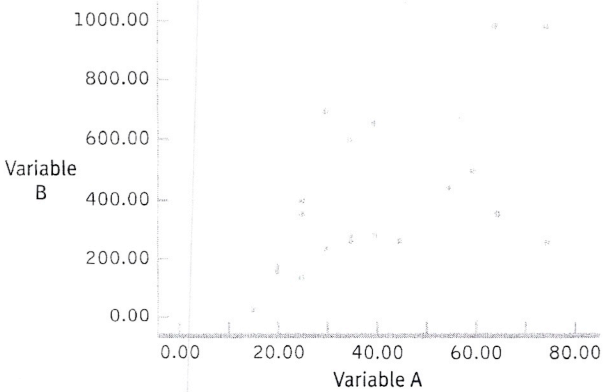
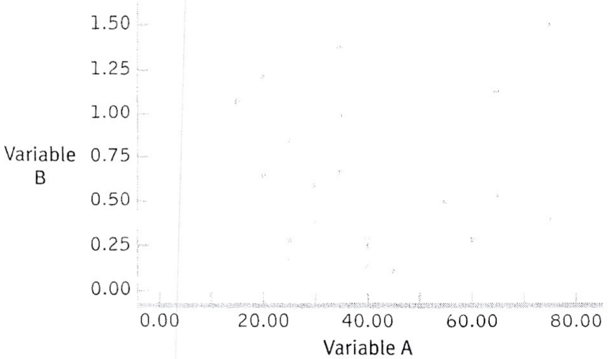
a.



b.



c.



13.14 Decide which of the three correlation coefficient values below goes with each of the scatterplots presented in Exercise 13.13 above.

a. 0.545
b. 0.018
c. −0.20

13.15 Use Cohen's guidelines to describe the strength of the following correlation coefficients:

a. −0.28
b. 0.79
c. 1.0
d. −0.015

13.16 For each of the pairs of correlation coefficients provided, determine which one indicates a stronger relation between variables:

a. −0.28 and −0.31
b. 0.79 and 0.61
c. 1.0 and −1.0
d. −0.15 and 0.13

13.17 Create a scatterplot for the following data:

X	*Y*
0.13	645
0.27	486
0.49	435
0.57	689
0.84	137
0.64	167

13.18 Create a scatterplot for the following data:

X	*Y*	*X*	*Y*
394	25	276	40
972	75	254	45
349	25	156	20
349	65	248	75
593	35		

13.19 Create a scatterplot for the following data:

X	*Y*
40	60
45	55
20	30
75	25
15	20
35	40
65	30

13.20 Calculate the correlation coefficient for the data provided in Exercise 13.17 by completing these three steps:

a. Calculate deviation scores, multiply the deviations for each individual, and sum all products. This is the numerator of the correlation coefficient equation.

b. Calculate the sum of squares for each variable. Then compute the square root of the product of the sums of squares. This is the denominator of the correlation coefficient equation.

c. Divide the numerator by the denominator to compute the coefficient, *r*.

13.21 Calculate the correlation coefficient for the data provided in Exercise 13.18 by completing these three steps:

a. Calculate deviation scores, multiply the deviations for each individual, and sum all products. This is the numerator of the correlation coefficient equation.

b. Calculate the sum of squares for each variable. Then compute the square root of the product of the sums of squares. This is the denominator of the correlation coefficient equation.

c. Divide the numerator by the denominator to compute the coefficient, *r*.

13.22 Calculate the correlation coefficient for the data provided in Exercise 13.19 by completing these three steps:

a. Calculate deviation scores, multiply the deviations for each individual, and sum all products. This is the numerator of the correlation coefficient equation.

b. Calculate the sum of squares for each variable. Then compute the square root of the product of the sums of squares. This is the denominator of the correlation coefficient equation.

c. Divide the numerator by the denominator to compute the coefficient, *r*.

13.23 Calculate degrees of freedom for each of the following studies:

a. Forty students were recruited for a study about the relation between knowledge regarding academic integrity and values held by students, with the idea that students with less knowledge would care less about the issue than students with greater amounts of knowledge.

b. Twenty-seven couples are surveyed regarding their years together and their relationship satisfaction.

c. Data are collected to examine the relation between size of dog and rate of bone and joint health issues. Veterinarians from around the country contributed data on 3113 dogs.

d. Hours spent studying per week was correlated with credit hour load for 72 students.

13.24 Calculate degrees of freedom for the data provided in each of the following:

a. Exercise 13.17

b. Exercise 13.18

c. Exercise 13.19

13.25 Determine the critical values, or cutoffs, assuming a two-tailed test with a *p* level of 0.05, for each of the designs described in Exercise 13.23.

13.26 Determine the critical values, or cutoffs, assuming a two-tailed test with a *p* level of 0.05, for the data provided in:

a. Exercise 13.17

b. Exercise 13.18

c. Exercise 13.19

Applying the Concepts

13.27 The *New York Times* reported that an officer of the International Society for Astrological Research, Anne Massey, stated that a certain phase of the planet Mercury, the retrograde phase, leads to breakdowns in areas as wide-ranging as communication and travel (Newman, 2006). The *Times* reporter, Andy Newman, documented the likelihood of breakdown on a number of variables in both phases, retrograde and nonretrograde. Newman discovered that, contrary to Massey's hypothesis, New Jersey Transit commuter trains were less likely to be late, by 0.4%, during the retrograde phase. On the other hand, consistent with Massey's hypothesis, the rate of baggage complaints at LaGuardia airport increased from 5.38 during nonretrograde periods to 5.44 during retrograde periods. Newman's findings were contradictory across all examined variables—rates of theft, computer crashes, traffic disruptions, delayed plane arrivals—with some variables backing Massey and others not. Newman cited a transportation statistics expert, Bruce Schaller, who said, "If all of this is due to randomness, that's the result you'd expect." Astrologer Massey counters that the pattern she predicts would only emerge across thousands of years of data.

a. Do reporter Newman's data suggest a correlation between Mercury's phase and breakdowns?

b. How do transportation expert Schaller's statement and Newman's contradictory results relate to what you learned about probability in Chapter 5? Discuss expected relative-frequency probability in your answer.

c. If there were indeed a small correlation that one could observe only across thousands of years of data, how useful would that knowledge be in terms of predicting events in your own life?

d. Write a brief response to Massey's contention of a correlation between Mercury's phases and breakdowns in aspects of day-to-day living.

13.28 In the newspaper column discussed at the beginning of this chapter, Paul Krugman (2006) mentioned obesity (as measured by body mass index) as a possible correlate of age at death.

a. Describe the likely correlation between these variables. Is it likely to be positive or negative? Explain.

b. Draw a scatterplot that depicts the correlation you described in part (a).

13.29 Does the amount that people exercise correlate with the number of friends they have? The accompanying table contains data collected in some of our statistics classes. The first column shows hours exercised per week and the second column shows the number of close friends reported by each participant.

Exercise	Friends	Exercise	Friends
1.00	4.00	8.00	4.00
.00	3.00	2.00	4.00
1.00	2.00	10.00	4.00
6.00	6.00	5.00	7.00
1.00	3.00	4.00	5.00
6.00	5.00	2.00	6.00
2.00	4.00	7.00	5.00
3.00	5.00	1.00	5.00
5.00	6.00		

a. Create a scatterplot of these data. Be sure to label both axes.

b. What does the scatterplot suggest about the relation between these two variables?

c. Would it be appropriate to calculate a Pearson correlation coefficient? Explain your answer.

13.30 A study on the relation between rejection and depression in adolescents conducted by one of the authors (Nolan, Flynn, & Garber, 2003) also collected data on externalizing behaviors (e.g., acting out in negative ways, such as causing fights) and anxiety. We wondered whether externalizing behaviors were related to feelings of anxiety. Some of the data are presented in the accompanying table.

Externalizing	Anxiety	Externalizing	Anxiety
9.00	37.00	6.00	33.00
7.00	23.00	2.00	26.00
7.00	26.00	6.00	35.00
3.00	21.00	6.00	23.00
11.00	42.00	9.00	28.00

a. Create a scatterplot of these data. Be sure to label both axes.

b. What does the scatterplot suggest about the relation between these two variables?

c. Would it be appropriate to calculate a Pearson correlation coefficient? Explain your answer.

d. Construct a second scatterplot, but this time add in the data for one more participant who scored 1 on externalizing and 45 on anxiety. Would you expect the correlation coefficient to be positive or negative now? Small in magnitude or large in magnitude?

e. The Pearson correlation coefficient for the first set of data is 0.61; for the second set of data it is 0.12. Explain why the correlation changed so much with the addition of just one participant.

13.31 Using the data in Exercise 13.30, perform all six steps of hypothesis testing to explore the relation between externalizing and anxiety.

a. Step 1: Identify the population, distribution, and assumptions.

b. Step 2: State the null and research hypotheses.

c. Step 3: Determine the characteristics of the comparison distribution.

d. Step 4: Determine the critical values, or cutoffs, assuming a two-tailed test with a p level of 0.05.

e. Step 5: Calculate the test statistic.

f. Step 6: Make a decision, including an evaluation of the size of the correlation using Cohen's guidelines.

13.32 For each of the following pairs of variables, would you expect a positive correlation or a negative correlation between the two variables? Explain your answer.

a. How hard the rain is falling and your commuting time

b. How often you say no to dessert and your body fat

c. The amount of wine you consume with dinner and your alertness after dinner

13.33 You may be aware of the stereotype about the crazy elderly person who owns a lot of cats. Have you wondered whether the stereotype is true? As a researcher, you decide to interview 100 senior citizens in a retirement complex. You assess all senior citizens on two variables: (1) the number of cats they own and (2) their level of mental health problems (a higher score indicates more problems).

a. Imagine that you found a positive relation between these two variables. What might you expect for someone who owns a lot of cats? Explain.

b. Imagine that you found a positive relation between these two variables. What might you expect for someone who owns no cats or just one cat? Explain.

c. Imagine that you found a negative relation between these two variables. What might you expect for someone who owns a lot of cats? Explain.

d. Imagine that you found a negative relation between these two variables. What might you expect for someone who owns no cats or just one cat? Explain.

13.34 Consider the scenario in Exercise 13.33 again. The two variables under consideration were (1) number of cats owned and (2) level of mental health problems (with a higher score indicating more problems). Each possible relation between these variables would be represented by a different scatterplot. Using data for about 10 participants, draw a scatterplot that depicts a correlation between these variables for each of the following:

a. A weak positive correlation
b. A strong positive correlation
c. A perfect positive correlation
d. A weak negative correlation
e. A strong negative correlation
f. A perfect negative correlation
g. No (or almost no) correlation

13.35 Graduate student Angela Holiday (2007) conducted a study examining perceptions of combat veterans suffering from mental illness. Participants read a description of a person, either a man or a woman, who had recently returned from combat in Iraq and who was suffering from depression. Participants rated the situation (combat in Iraq) with respect to how traumatic they believed it was; they also rated the combat veterans on a range of variables, including scales that assessed how masculine and how feminine they perceived the person to be. Among other analyses, Holiday examined the relation between the perception of the situation as being traumatic and the perception of the veteran as being masculine or feminine. When the person was male, the perception of the situation as traumatic was strongly positively correlated with the perception of the man as feminine but was only weakly positively correlated with the perception of the man as masculine. What would you expect when the person was female? The accompanying table presents some of the data for the perception of the situation as traumatic (on a scale of 1–10, with 10 being the most traumatic) and the perception of the woman as feminine (on a scale of 1–10, with 10 being the most feminine).

Traumatic	Feminine
5	6
6	5
4	6
5	6
7	4
8	5

a. Draw a scatterplot for these data. Does the scatterplot suggest that it is appropriate to calculate a Pearson correlation coefficient? Explain.
b. Calculate the Pearson correlation coefficient.
c. State what the Pearson correlation coefficient tells us about the relation between these two variables.
d. Explain why the pattern of pairs of deviation scores enables us to understand the relation between the two variables. (That is, consider whether pairs of deviations tend to have the same sign or opposite signs.)

13.36 Using the data and your work in Exercise 13.35, perform the remaining five steps of hypothesis testing to explore the relation between trauma and femininity.

a. Step 1: Identify the population, distribution, and assumptions.
b. Step 2: State the null and research hypotheses.
c. Step 3: Determine the characteristics of the comparison distribution.
d. Step 4: Determine the critical values, or cutoffs, assuming a two-tailed test with a p level of 0.05.
e. Step 6: Make a decision, including an evaluation of the size of the correlation using Cohen's guidelines.

13.37 See the description of Holiday's experiment in Exercise 13.35. We calculated the correlation coefficient for the relation between the perception of a situation as traumatic and the perception of a woman's femininity. Now let's look at data to examine the relation between the perception of a situation as traumatic and the perception of a woman's masculinity.

Traumatic	Masculine
5	3
6	3
4	2
5	2
7	4
8	3

a. Draw a scatterplot for these data. Does the scatterplot suggest that it is appropriate to calculate a Pearson correlation coefficient? Explain.
b. Calculate the Pearson correlation coefficient.
c. State what the Pearson correlation coefficient tells us about the relation between these two variables.
d. Explain why the pattern of pairs of deviation scores enables us to understand the relation between the two variables. (That is, consider whether pairs of deviation scores tend to share the same sign or to have opposite signs.)

e. Explain how the relations between the perception of a situation as traumatic and the perception of a woman as either masculine or feminine differ from those same relations with respect to men.

13.38 Using the data and your work in Exercise 13.37, perform the remaining five steps of hypothesis testing to explore the relation between trauma and masculinity.

a. Step 1: Identify the population, distribution, and assumptions.

b. Step 2: State the null and research hypotheses.

c. Step 3: Determine the characteristics of the comparison distribution.

d. Step 4: Determine the critical values, or cutoffs, assuming a two-tailed test with a p level of 0.05.

e. Step 6: Make a decision, including an evaluation of the size of the correlation using Cohen's guidelines.

13.39 A friend tells you that there is a correlation between how late she's running and the amount of traffic. Whenever she's going somewhere and she's behind schedule, there's a lot of traffic. And when she has plenty of time, the traffic is sparser. She tells you that this happens no matter what time of day she's traveling or where she's going. She concludes that she's cursed with respect to traffic.

a. Explain to your friend how other phenomena, such as coincidence, superstition, and the confirmation bias, might explain her conclusion.

b. How could she quantify the relation between these two variables: the degree to which she is late and the amount of traffic? In your answer, be sure to explain how you might operationalize these variables. Of course, these could be operationalized in many different ways.

13.40 The trashy tabloid *Weekly World News* published an article—"Water from Mountain Falls Can Make You a Genius"—stating that drinking water from a special waterfall in a secret location in Switzerland "boosts IQ by 14 points—in the blink of an eye!" (exclamation point in the original). Hans and Inger Thurlemann, two hikers lost in the woods, drank some of the water, noticed an improvement in their thinking, and instantly found their way out of the woods. The more water they drank, the smarter they seemed to get. They credited the "miracle water" with enhancing their IQs. They brought some of the water home to their friends, who also claimed to notice an improvement in their thinking. Use this described correlation to illustrate the importance of random sampling to generalize findings.

13.41 A *New York Times* editorial ("Public vs. Private Schools," 2006) cited a finding by the U.S. Department of Education that standardized test scores were significantly higher among students in private schools than among students in public schools.

a. What are the researchers suggesting with respect to causality?

b. How could this correlation be explained by reversing the direction of hypothesized causality? Be specific.

c. How might a third variable account for this correlation? Be specific. Note that there are many possible third variables.

(*Note:* In the actual study, the difference between types of school disappeared when the researchers statistically controlled for related third variables including race, gender, parents' education, and family income.)

13.42 How safe are convertibles? *USA Today* (Healey, 2006) examined the pros and cons of convertible automobiles. The Insurance Institute for Highway Safety, the newspaper reported, determined that, depending on the model, 52 to 99 drivers of 1 million registered convertibles died in a car crash. The average rate of deaths for all passenger cars was 87. "Counter to conventional wisdom," the reporter wrote, "convertibles generally aren't unsafe."

a. What does the reporter suggest about the safety of convertibles?

b. Can you think of another explanation for the fairly low fatality rates? (*Hint:* The same article reported that convertibles "are often second or third cars.")

c. Given your explanation in part (b), suggest data that might make for a more appropriate comparison.

13.43 As this chapter is being written, March Madness, the final championship series in college basketball in the United States, is in full swing. The national sports media and news media enjoy covering the games and including human interest stories about the young men and women who compete at this elite level. Some of these athletes also compete at the highest level in academics. Although the stereotype of the dumb jock might be strong and ever-present, a fair amount of research shows that athletes maintain decent grades and competitive graduation rates when compared to nonathletes. Let's play with some data to explore the relation between GPA and participation in athletics. Data are presented here for a hypothetical team, including the GPA for each athlete and the average number of minutes played per game.

a. Create a scatterplot of these data and describe your impression of the relation between these variables based on the scatterplot.

b. Compute the Pearson correlation coefficient for these data.

c. Explain why the correlation coefficient you just computed is a descriptive statistic and not an inferential statistic. What would you need to do to make this an inferential statistic?