

- To investigate whether there is convincing evidence that the true correlation between two numerical variables is positive (or negative), we conduct a hypothesis test where the null hypothesis is that the true correlation between the two variables is 0.
- To simulate the distribution of the correlation, shuffle the values of one of the variables and randomly pair them with the values of the other variable. Then calculate the correlation to see what values of the correlation could arise due to *RANDOM CHANCE* alone.
- A **time plot** of a numerical variable plots each *PERFORMANCE* against the time at which it was measured in order to observe possible trends over time and departures from these trends. The time periods are placed on the horizontal axis of the graph and the variable being investigated is placed on the vertical axis.
- A **moving average** is the average of an athlete's *PERFORMANCES* in a specified time period and the time periods immediately before and after the specified time period. Moving averages are used to smooth time plots and make it easier to see trends.

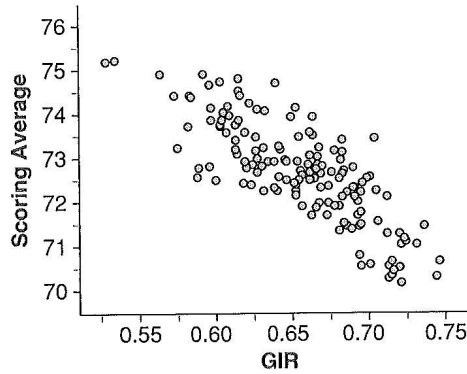
For Practice

The table below shows the number of passing yards, number of rushing yards, and number of points scored in each of the 16 regular season games for the 2008 Detroit Lions. Use these data to answer Exercises 1 and 2.

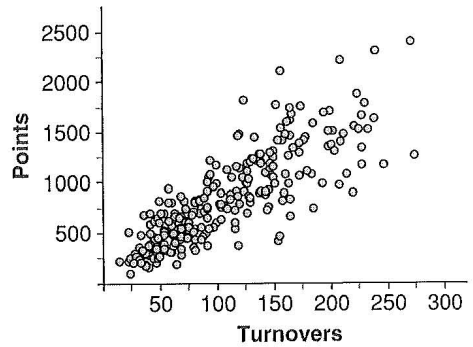
PASSING YARDS	RUSHING YARDS	POINTS
246	70	21
262	49	25
124	116	13
131	54	7
112	100	10
249	77	21
217	57	17
280	53	23
153	103	14
186	130	22
99	108	20
131	23	10
191	77	16
233	90	21
126	129	7
220	96	21

1. Consider the relationship between passing yards and points scored for the 2008 Detroit Lions.
 - (a) Which variable, passing yards or points scored, should be the explanatory variable in this case? Explain.
 - (b) Make a scatterplot to display the relationship between passing yards and points scored for the 2008 Detroit Lions.
2. Consider the relationship between rushing yards and points scored for the 2008 Detroit Lions.
 - (a) Which variable, rushing yards or points scored, should be the explanatory variable in this case? Explain.
 - (b) Make a scatterplot to display the relationship between rushing yards and points scored for the 2008 Detroit Lions.
3. Pick a sport of your choice and identify two variables that should have a positive association. Explain your reasoning and do not use any of the examples in the reading or exercises!
4. Pick a sport of your choice and identify two variables that should have a negative association. Explain your reasoning and do not use any of the examples in the reading or exercises!
5. There was a negative association between passing yards allowed and wins for NFL teams in 2008.
 - (a) Explain what it means to have a negative association in this context.
 - (b) In the 2008 season, the Jacksonville Jaguars gave up 3586 passing yards and had 5 wins, while the San Diego Chargers gave up 3958 passing yards and had 8 wins. Explain why this is inconsistent with the negative association described in part (a).
 - (c) Explain why it is still acceptable to say that there is a negative association between passing yards allowed and wins, even with the inconsistency described in part (b).
6. There was a positive association between points scored and wins for NFL teams in 2008.
 - (a) Explain what it means to have a positive association in this context.
 - (b) In the 2008 season, the New Orleans Saints scored 463 points and had 8 wins, while the Tennessee Titans scored 375 points and had 13 wins. Explain why this is inconsistent with the positive association described in part (a).
 - (c) Explain why it is still acceptable to say that there is a positive association between points scored and wins, even with the inconsistency described in part (b).
7. The scatterplot below shows the relationship between greens-in-regulation (GIR) and scoring average using data from the 2008 LPGA tour.
 - (a) Describe the scatterplot in terms of direction, form, and strength.

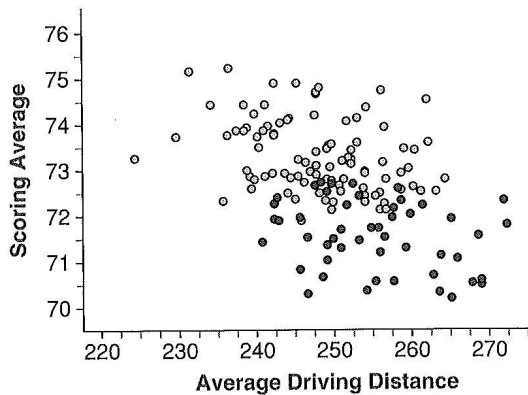
- (b) Explain why greens-in-regulation was used as the explanatory variable instead of scoring average.



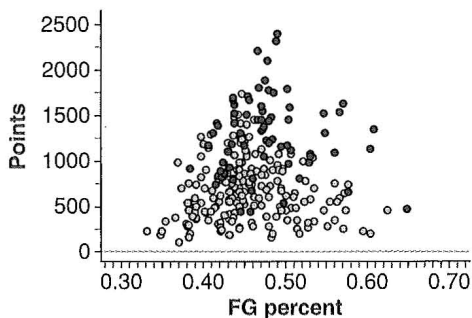
8. The scatterplot at right shows the relationship between turnovers and points scored for all NBA players who played in at least 60 games during the 2008–2009 regular season.



- (a) Describe the scatterplot in terms of direction, form, and strength.
- (b) Based on the scatterplot, can we conclude that having more turnovers causes players to score more points? Explain.
9. Below is a scatterplot of average driving distance vs. scoring average for the top 50 money winners (labeled with blue circles) and for everyone else (labeled with gray circles) using LPGA data from 2008. Compare and contrast the relationships between these variables for the two groups of golfers.



10. At right is a scatterplot showing field goal percentage and points scored for all NBA players who played in at least 60 games during the 2008–2009 regular season. Players who started more than 70 games are labeled with blue circles and players who started at most 70 games are labeled with gray circles. Compare and contrast the relationships between these variables for the two groups of players.

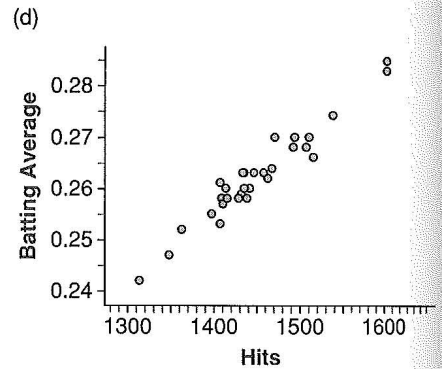
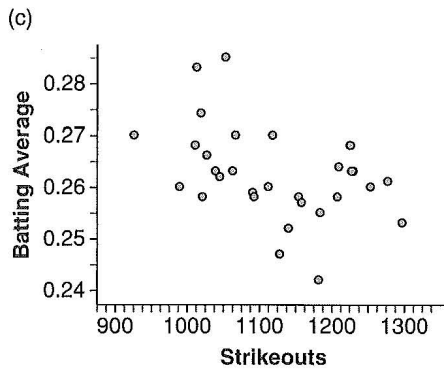
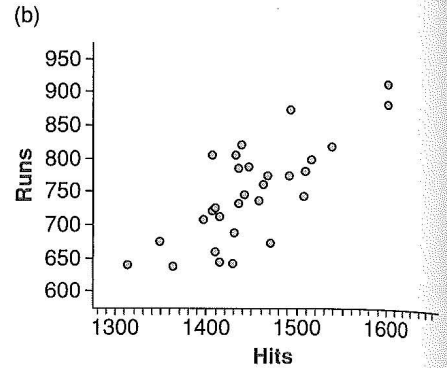
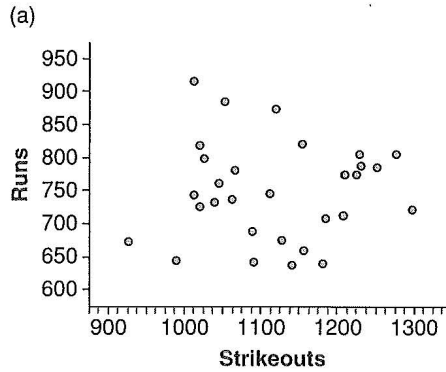


The table below shows the height (in inches), average number of points scored per game, and average number of rebounds per game during the 2010–2011 regular season for the nine members of the Miami Heat with the most number of minutes played. Use these data to answer Exercises 11–12.

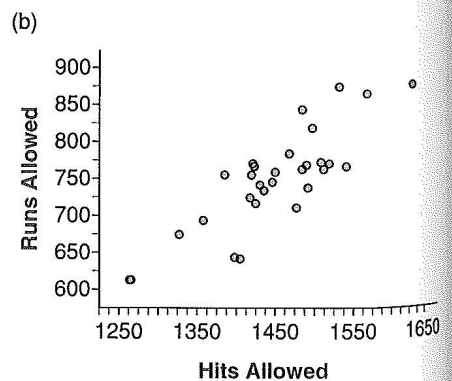
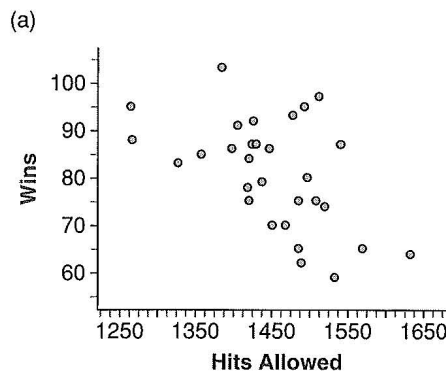
PLAYER	HEIGHT	POINTS PER GAME	REBOUNDS PER GAME
LeBron James	80	26.7	7.5
Dwayne Wade	76	25.5	6.4
Chris Bosh	82	18.7	8.3
Mario Chalmers	73	6.4	2.1
James Jones	80	5.9	2.0
Joel Anthony	81	2.0	3.5
Zydrunas Ilgauskas	87	5.0	4.0
Carlos Arroyo	74	5.6	1.6
Eddie House	73	6.5	1.6

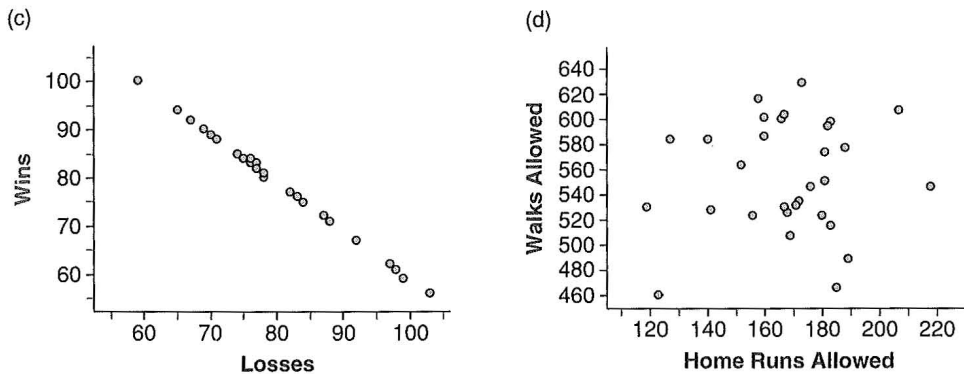
11. Make a scatterplot to display the association between height and average number of points scored per game for these players on the Miami Heat. Briefly describe the association.
12. Make a scatterplot to display the association between height and average number of rebounds per game for these players on the Miami Heat. Briefly describe the association.
13. Draw two scatterplots that have the same form and direction, but different strengths.
14. Draw two scatterplots that have the same direction and strength, but different forms.

15. The following scatterplots show the associations between various hitting statistics for the 30 Major League Baseball teams during the 2009 regular season. Estimate the correlation for each association and briefly explain your reasoning.



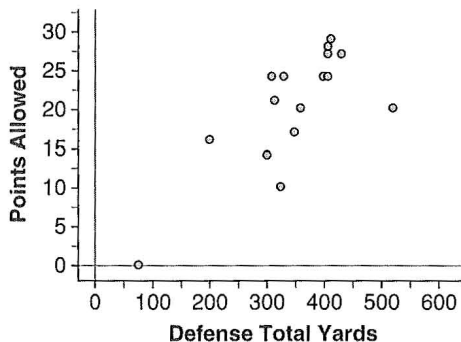
16. The following scatterplots show the associations between various pitching statistics for the 30 Major League Baseball teams during the 2009 regular season. Estimate the correlation for each association and briefly explain your reasoning.



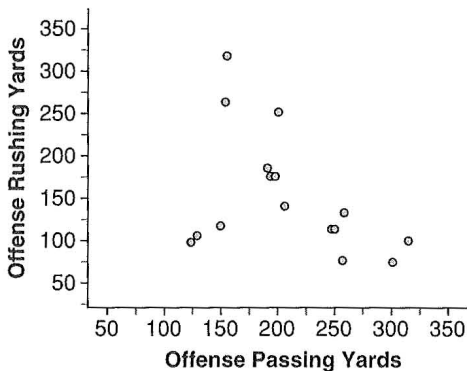


17. Suppose that a PE teacher collected data about the students in his class. Some of these variables included number of pull-ups in 1 minute, number of push-ups in 1 minute, number of sit-ups in 1 minute, and weight. The teacher then calculated the correlation between number of pull-ups and each of the other three variables and found the following correlations: $r = 0.9$, $r = -0.5$, $r = 0.3$. Which correlation goes with which variable? Explain.
18. Suppose that a PE teacher collected data about the students in his class. Some of these variables included 40-meter sprint time, long jump distance (running start), broad jump distance (standing start), and vertical jump height. The teacher then calculated the correlation between long jump distance and each of the other three variables and found the following correlations: $r = 0.8$, $r = -0.7$, $r = 0.3$. Which correlation goes with which variable? Explain.
19. Suppose that all baseball players had exactly 5 times as many runs batted in as home runs. Describe what information this provides about the correlation between runs batted in and home runs.
20. Explain why it doesn't make sense to calculate the correlation for the relationship between gender and earnings in professional golf.
21. In Exercises 1 and 2, you made scatterplots to investigate the relationship between passing yards and points scored and the relationship between rushing yards and points scored for the 2008 Detroit Lions.
- Find the correlation (r) for both relationships.
 - Briefly describe what information the correlation provides about each relationship.
 - Does it matter which variable is the explanatory variable and which is the response variable when you calculate these correlations? Explain.

- 22.** In Exercises 11 and 12, you made scatterplots to investigate the relationship between height and average points scored per game and the relationship between height and average number of rebounds per game for the 2010–2011 Miami Heat.
- Find the correlation (r) for both relationships.
 - Briefly describe what information the correlation provides about each relationship.
 - If the heights were measured in centimeters instead of inches, how would this change the correlations? Explain.
- 23.** The scatterplot below shows the number of yards allowed and the number of points allowed by the Atlanta Falcons' defense in the 2008 regular season.
- Briefly describe the association.
 - What effect does the game in the lower left have on the correlation? Explain.

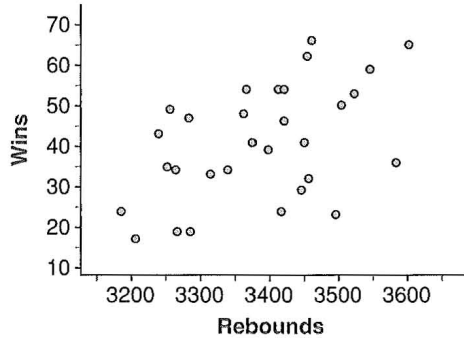


- 24.** The scatterplot below shows the number of passing yards and the number of rushing yards for the Atlanta Falcons' offense in the 2008 regular season.
- Briefly describe the association.
 - What effect do the three games in the lower left have on the correlation? Explain.

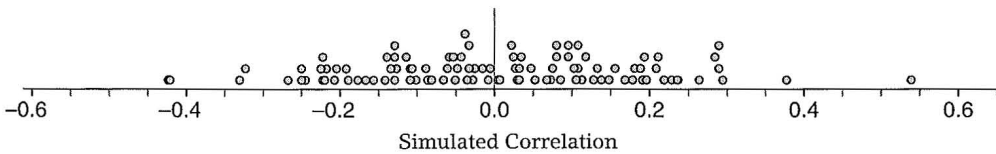


- 25. Sketch a scatterplot with 15 observations, where 14 of the observations show a strong positive association but the correlation is negative.
- 26. Sketch a scatterplot with 15 observations, where 14 of the observations show no association but the correlation is close to -1 .

27. Is there a positive association between rebounds and wins in the NBA? The scatterplot at right shows the relationship between rebounds and wins in the 2008–2009 NBA regular season.

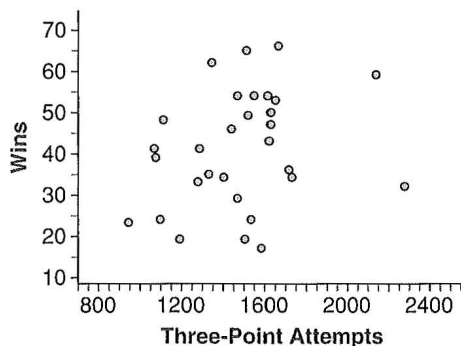


- (a) The value of the correlation for these data is $r = 0.49$. Describe what information this value and the scatterplot provide about the relationship between rebounds and wins.
- (b) State the hypotheses we are interested in testing.
- (c) Describe how to simulate the distribution of the correlation, assuming that the true correlation is 0.
- (d) Here are the results of 100 trials of the simulation. Use the results to estimate and interpret the p -value and make an appropriate conclusion.

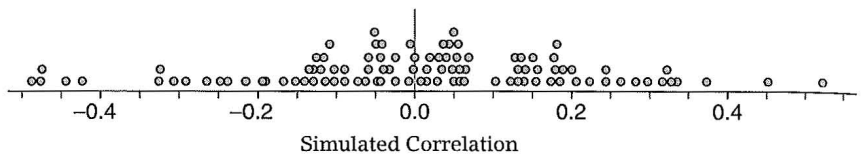


- (e) If there was convincing evidence that a positive association existed between rebounds and wins, would trading for players who are really good at rebounding cause a team to win more games? Explain.

28. Is there a positive association between the number of three-point shot attempts and the number of wins for teams in the NBA? The scatterplot at right shows the relationship between three-point attempts and wins for the 2008–2009 NBA regular season.

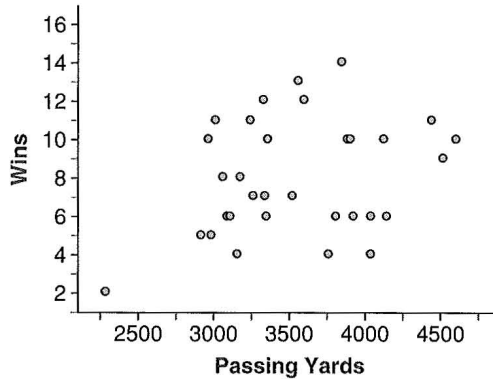


- (a) The value of the correlation for these data is $r = 0.26$. Describe what information this value and the scatterplot provide about the relationship between three-point attempts and wins.
- (b) State the hypotheses we are interested in testing.
- (c) Describe how to simulate the distribution of the correlation, assuming that the true correlation is 0.
- (d) Here are the results of 100 trials of the simulation. Use the results to estimate and interpret the p -value and make an appropriate conclusion.



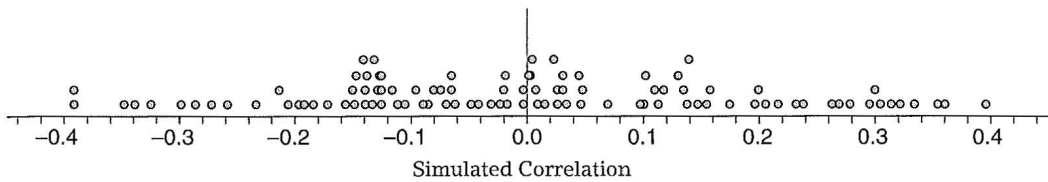
- (e) The team to the lower right in the scatterplot is the New York Knicks. If the Knicks were removed from the data, how would this affect the p -value? Explain.

29. Earlier in the chapter, we decided that there was convincing evidence of a positive association between rushing yards and wins in the NFL. Is this true for passing yards as well? The following scatterplot shows the relationship between passing yards and wins for the 2010 NFL regular season.



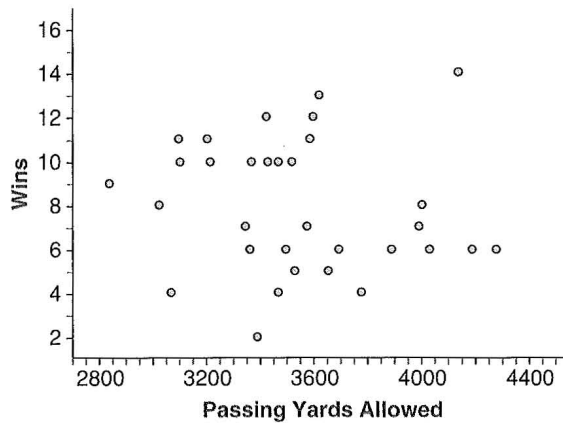
- (a) The value of the correlation for these data is $r = 0.29$. Describe what information this value and the scatterplot provide about the relationship between passing yards and wins.
- (b) State the hypotheses we are interested in testing.
- (c) Describe how to simulate the distribution of the correlation, assuming that the true correlation is 0.

(d) Here are the results of 100 trials of the simulation. Use the results to estimate and interpret the p -value and make an appropriate conclusion.

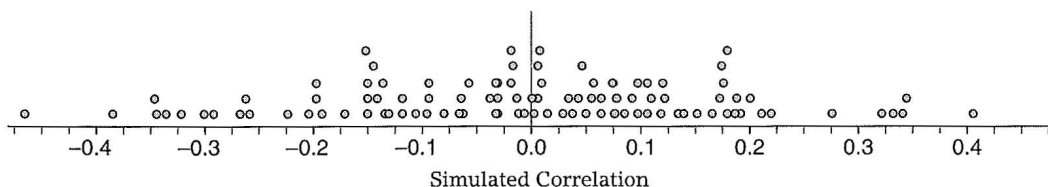


(e) The team to the lower left in the scatterplot is the Carolina Panthers. If the Panthers were removed from the data, how would this affect the p -value? Explain.

30. In the previous exercise, we investigated whether there was convincing evidence of a positive association between passing yards and wins in the NFL. We can also explore this question by looking at the relationship between passing yards *allowed* and wins. The following scatterplot shows the relationship between passing yards allowed and wins for the 2010 NFL regular season.



- (a) The value of the correlation for these data is $r = -0.13$. Describe what information this value and the scatterplot provide about the relationship between passing yards and wins.
- (b) State the hypotheses we are interested in testing.
- (c) Describe how to simulate the distribution of the correlation, assuming that the true correlation is 0.
- (d) Here are the results of 100 trials of the simulation. Use the results to estimate and interpret the p -value and make an appropriate conclusion.



- (e) If your conclusion in part (d) is in error, which type of error did you commit? Explain.

The table below shows the number of wins, number of goals scored, and number of goals allowed for the 15 Major League Soccer teams during the 2009 regular season.⁴ Use these data to answer Exercises 31–32.

TEAM	WINS	GOALS SCORED	GOALS ALLOWED
Columbus	13	41	31
Chicago	11	39	34
New England	11	33	37
D.C. United	9	43	44
Toronto FC	10	37	46
Kansas City	8	33	42
New York	5	27	47
Los Angeles	12	36	31
Houston	13	39	29
Seattle	12	38	29
Chivas USA	13	34	31
Real Salt Lake	11	43	35
Colorado	10	42	38
FC Dallas	11	50	47
San Jose	7	36	50

31. Is there a positive association between the number of goals scored and the number of wins in Major League Soccer?
- (a) Use the data in the table above to make a scatterplot of goals scored and wins. Briefly describe what you see.
- (b) For the hypotheses below, what test statistic would you use? What is its value?
 H_0 : The true correlation between goals scored and wins is 0.
 H_a : The true correlation is positive.
- (c) Describe how to simulate the distribution of your test statistic and do at least 20 trials of your simulation.
- (d) Using the results of your simulation, estimate the p -value and make an appropriate conclusion.
- (e) If your conclusion was in error, which type of error did you commit? Explain.
32. Is there a negative association between the number of goals allowed and the number of wins in Major League Soccer?
- (a) Use the data in the table above to make a scatterplot of goals allowed and wins. Briefly describe what you see.

(b) For the hypotheses below, what test statistic would you use? What is its value?

H_0 : The true correlation between goals allowed and wins is 0.

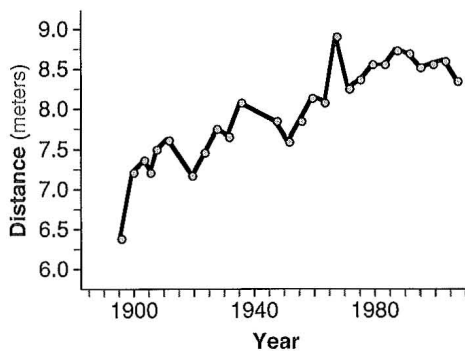
H_a : The true correlation is negative.

(c) Describe how to simulate the distribution of your test statistic and do at least 20 trials of your simulation.

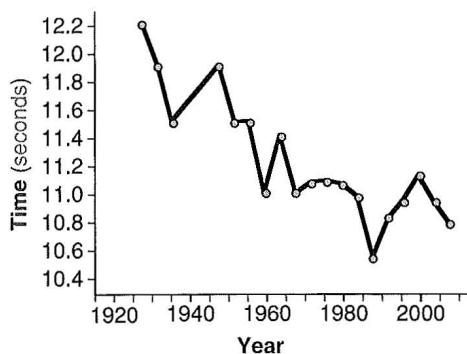
(d) Using the results of your simulation, estimate the p -value and make an appropriate conclusion.

(e) If your conclusion was in error, which type of error did you commit? Explain.

33. The following time plot shows the winning distances in the men's Olympic long jump competition for the years 1896–2008.⁵ Briefly describe any trends that you see. Do you think the overall trend will continue indefinitely? *Note:* The Olympics were not held in 1916, 1940, and 1944 due to World War I and World War II.



34. The following time plot shows the winning times in the women's Olympic 100-meter sprint for the years 1928–2008. Briefly describe any trends that you see. Do you think the overall trend will continue indefinitely? *Note:* The Olympics were not held in 1916, 1940, and 1944 due to World War I and World War II.



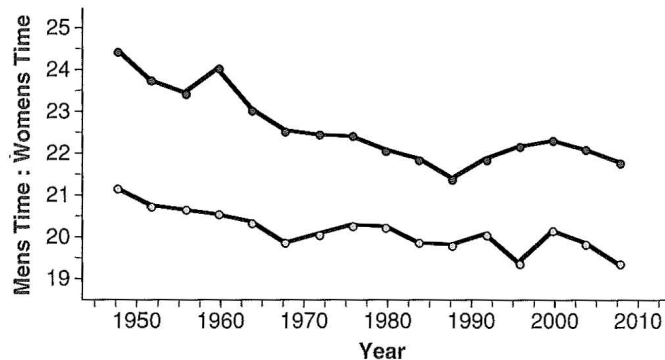
35. The following table shows the number of rushing yards for each year in the career of Barry Sanders of the NFL's Detroit Lions. Make a time plot for these data and describe any trends you see.

YEAR	RUSHING YARDS	YEAR	RUSHING YARDS
1989	1470	1994	1883
1990	1304	1995	1500
1991	1548	1996	1553
1992	1352	1997	2053
1993	1115	1998	1491

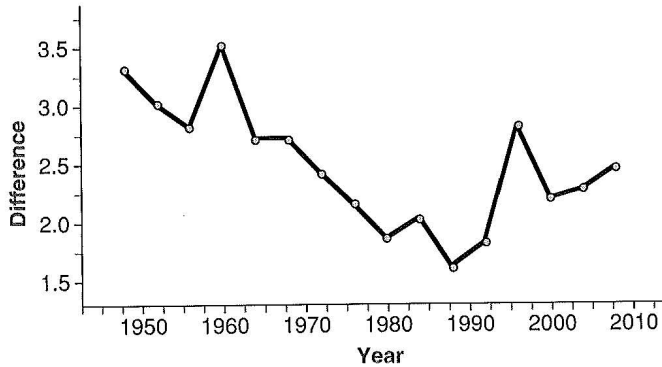
36. The following table shows the number of points (goals + assists) for each year in the career of NHL hockey player Wayne Gretzky. Make a time plot for these data and describe any trends you see.

SEASON	POINTS	SEASON	POINTS
1979	104	1990	142
1980	137	1991	163
1981	164	1992	121
1982	212	1993	65
1983	196	1994	130
1984	205	1995	48
1985	208	1996	102
1986	215	1997	97
1987	183	1998	90
1988	149	1999	62
1989	168		

37. The following time plot shows the winning times (in seconds) for the men's and women's 200-meter sprint in the Olympics since 1948. Briefly compare the *PERFORMANCES* of men and women using the time plot for men (labeled with gray circles) and the time plot for women (labeled with blue circles.)



38. The following time plot shows the *difference* in winning times (in seconds) for men and women in the Olympic 200-meter sprint (women's time – men's time). Use the time plot to compare the *PERFORMANCES* of men and women in the Olympic 200-meter sprint.



39. In Exercise 35, you made a time plot of Barry Sanders's yearly rushing totals. Use the data provided in that problem to complete the following:
- (a) Calculate Sanders's 3-year moving average for 1990. Show your work.
 - (b) Calculate the 3-year moving average for the remaining years and use them to make a smoothed time plot. Describe any trends that you see.
40. In Exercise 36, you made a time plot of Wayne Gretzky's yearly point totals. Use the data provided in that problem to complete the following:
- (a) Calculate Gretzky's 3-year moving average for 1990. Show your work.
 - (b) Calculate the 3-year moving average for the remaining years and use them to make a smoothed time plot. Describe any trends that you see.
41. The data in the table at right show the home run (HR) totals for each year in the career of baseball player Mark McGwire.

YEAR	HR	YEAR	HR
1986	3	1994	9
1987	49	1995	39
1988	32	1996	52
1989	33	1997	58
1990	39	1998	70
1991	22	1999	65
1992	42	2000	32
1993	9	2001	29

- (a) Make a time plot to show the trends in McGwire's home run totals during his career.
- (b) Show how to calculate McGwire's 3-year moving average for 1987.
- (c) Calculate the 3-year moving average for the remaining years. Then use these to draw a smoothed time plot on top of the regular time plot you made in part (a), using a different marking symbol.
- (d) How are the two graphs different? How are they the same?
- (e) Is it possible to use the trends in the time plot to prove that McGwire used steroids? Explain.

YEAR	HR	YEAR	HR
1986	16	1997	40
1987	25	1998	37
1988	24	1999	34
1989	19	2000	49
1990	33	2001	73
1991	25	2002	46
1992	34	2003	45
1993	46	2004	45
1994	37	2005	5
1995	33	2006	26
1996	42	2007	28

42. The data in the table at left show the home run (HR) totals for each year in the career of baseball player Barry Bonds.
- Make a time plot to show the trends in Bonds's home run totals during his career.
 - Show how to calculate Bonds's 3-year moving average for 1987.
 - Calculate the 3-year moving average for the remaining years. Then use these to draw a smoothed time plot on top of the regular time plot you made in part (a), using a different marking symbol.
 - How are the two graphs different? How are they the same?
 - Is it possible to use the trends in the time plot to prove that Bonds used steroids? Explain.

CHAPTER REVIEW EXERCISES

43. The following table shows the number of wins and the average number of points allowed for the 12 WNBA teams in the 2010 regular season.

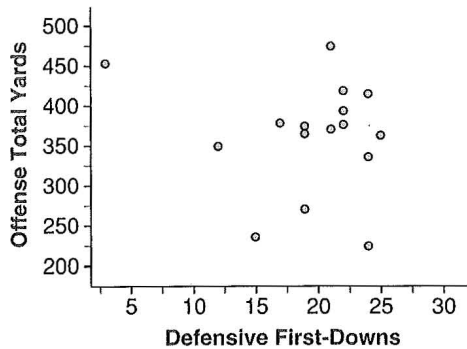
TEAM	WINS	POINTS ALLOWED
Washington	22	73.3
New York	22	76.0
Indiana	21	74.1
Atlanta	19	83.1
Connecticut	17	79.9
Chicago	14	76.8
Seattle	28	73.9
Phoenix	15	93.8
San Antonio	14	80.1
Minnesota	13	82.1
Los Angeles	13	81.2
Tulsa	6	89.8

- Which variable, number of wins or average number of points allowed, should be the explanatory variable? Explain.
- Make a scatterplot to display the association between the number of wins and the average number of points allowed for WNBA teams in 2010.

- (c) Describe the association in the scatterplot.
- (d) Calculate the correlation between the number of wins and the average number of points allowed for WNBA teams in 2010. What information does the correlation provide about this association?
- (e) If you were to reverse the explanatory and response variables, how would this change the correlation?

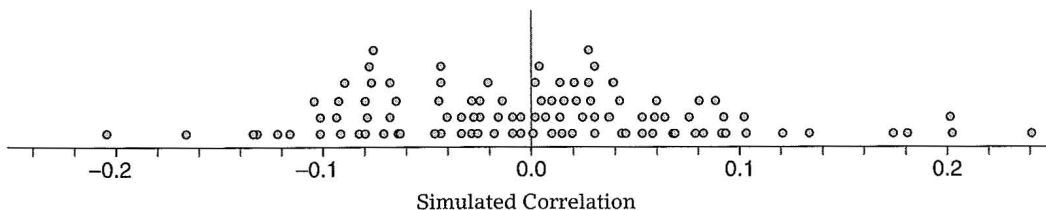
44. The scatterplot below shows the number of first downs allowed by the Atlanta Falcons' defense and the number of yards gained by the Atlanta Falcons' offense in the 2008 regular season.

- (a) Briefly describe the association.
- (b) What effect does the game in the upper left have on the correlation? Explain.



45. Earlier in the chapter, we determined that there was a relatively weak, positive, linear relationship between a baseball player's batting average in 2009 and his batting average in 2010. The correlation for these data is $r = 0.37$.

- (a) To see whether there is convincing evidence of a positive association between a player's batting average in 2009 and his batting average in 2010, what hypotheses should we test?
- (b) Describe how to simulate the distribution of the correlation, assuming that the true correlation between a player's batting average in 2009 and his batting average in 2010 is 0.
- (c) Here are the results of 100 trials of the simulation. Use the results to estimate and interpret the p -value and make an appropriate conclusion.

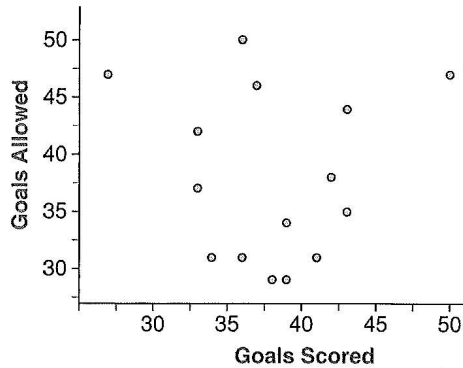


- (d) Assuming that there is convincing evidence of a positive association between a player's batting average in 2009 and his batting average in

2010, does an above-average batting average in 2009 guarantee an above-average batting average in 2010? Explain.

- (e) Even though the association was relatively weak, there is convincing evidence that the true correlation is positive. Explain how it is possible that a relatively weak association could provide very convincing evidence that an association exists.

46. Is there a relationship between the number of goals scored and number of goals allowed in Major League Soccer?

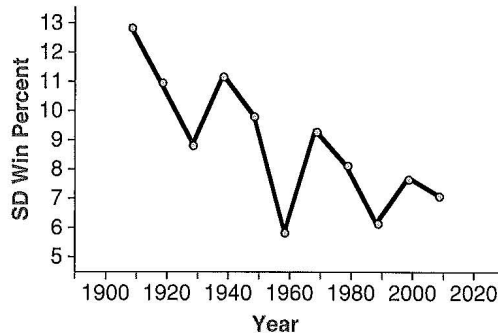


- (a) Above is a scatterplot of goals scored and goals allowed. Briefly describe what you see.
- (b) The correlation for these data is $r = -0.027$. What information does this value provide?
- (c) For a test of the hypotheses below, will the p -value be big or small? Explain.

H_0 : The true correlation between goals scored and goals allowed is 0.

H_a : The true correlation is negative.

47. Earlier in this chapter, we looked at a time plot showing the standard deviation of winning percentages for Major League Baseball teams from 1989–2009. Here is a similar time plot, showing the standard deviations starting in 1909 and every 10 years after. Briefly describe the trends that you see. Comment on possible causes for these trends.



48. The table at right shows the yearly rushing yards during the career of NFL running back Edgerrin James.

YEAR	RUSHING YARDS
1999	1553
2000	1709
2001	662
2002	989
2003	1259
2004	1548
2005	1506
2006	1159
2007	1222
2008	514
2009	125

- Calculate the 3-year moving average for James's 2000 season. Show your work.
- Calculate the 3-year moving average for the remaining years and make a smoothed time plot.
- Describe any trends you see in the time plot.
- Explain why it would not be appropriate to calculate the correlation between these variables.

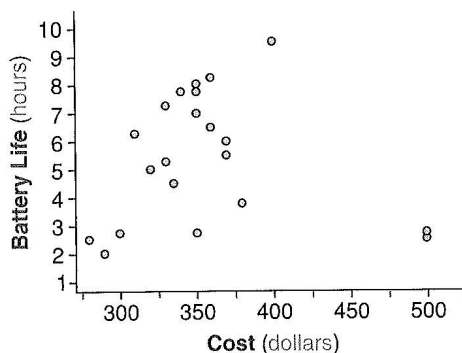
OTHER APPLICATIONS

49. Is there an association between the price of a used car and the number of miles it has been driven? The table at right shows the number of miles (in thousands of miles) and price (in thousands of dollars) for a sample of used 2002–2006 Honda CR-Vs.⁶

MILES DRIVEN (THOUSANDS OF MILES)	PRICE (THOUSANDS OF DOLLARS)
22	18.0
29	16.5
35	15.0
39	14.0
45	14.6
49	15.0
55	13.6
56	14.6
69	12.0
70	14.5
86	11.0

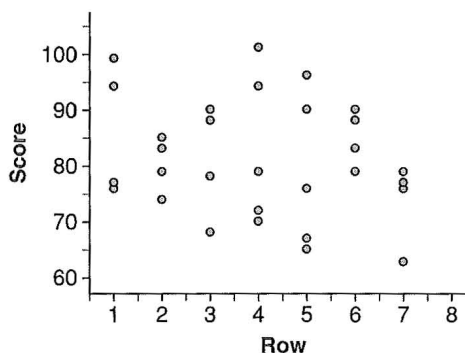
- Which variable, miles driven or price, should be the explanatory variable? Explain.
- Make a scatterplot to display the association between the miles driven and price for this sample of Honda CR-Vs.
- Describe the association in the scatterplot.
- Calculate the correlation between the miles driven and price for this sample of Honda CR-Vs. What information does the correlation provide about this association?
- If you were to convert the number of miles to the number of kilometers, how would this change the correlation? Explain.

50. Netbooks, a smaller alternative to laptop computers, are popular because of their portability and relatively low cost. They are also popular because their batteries tend to last longer than batteries in laptops. *Consumer Reports* did a study of 22 netbooks in its February 2010 issue. The scatterplot at right shows the relationship between the cost of the netbook (in dollars) and the battery life (in hours). The correlation between these variables is $r = -0.07$.

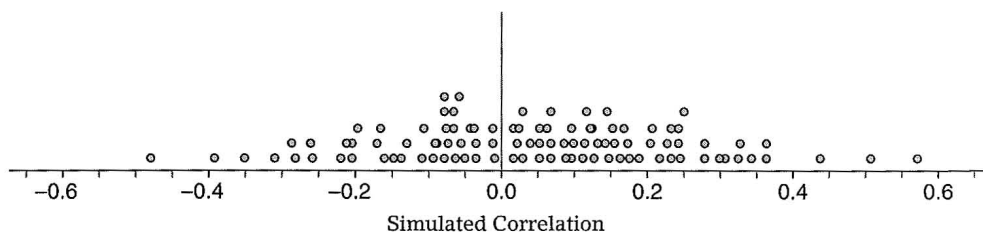


- Briefly describe the association.
- What effect do the two netbooks in the lower right have on the correlation? Explain.

51. Many people believe that students learn better if they sit closer to the front of the classroom. Does sitting closer *cause* higher achievement, or do better students simply choose to sit in the front? To investigate, an AP Statistics teacher randomly assigned students to seat locations in his classroom for a particular chapter and recorded the test score for each student at the end of the chapter. A scatterplot showing the row number (row 1 is closest to the front of the classroom) and test score is shown below. The correlation between these variables is $r = -0.22$.



- (a) Briefly describe the association between row number and test score.
- (b) To see whether there is convincing evidence of a negative association between a student's row number and his or her test score, what hypotheses should we test?
- (c) Describe how to simulate the distribution of the correlation, assuming that the true correlation between a student's row number and test score is 0.
- (d) Here are the results of 100 trials of the simulation. Use the results to estimate and interpret the p -value and make an appropriate conclusion.



- (e) If there is convincing evidence that students who sit closer get higher test scores, can we conclude that the seat location is the cause? Explain.

52. The table at right shows the yearly closing value of the Dow Jones Industrial Average (DJIA) for the years 2000–2010.⁷

- Make a time plot to show the trends in DJIA for the years 2000–2010.
- Show how to calculate the 3-year moving average for the year 2001.
- Calculate the 3-year moving average for the remaining years. Then use these to draw a smoothed time plot on top of the regular time plot you made in part (a), using a different marking symbol.
- How are the two graphs different? How are they the same?

YEAR	CLOSING PRICE
2000	10,787
2001	10,022
2002	8342
2003	10,454
2004	10,783
2005	10,718
2006	12,463
2007	13,265
2008	8776
2009	10,428
2010	11,578

FOR INVESTIGATION

- Which of two explanatory variables has a stronger association with a response variable? For example, do points scored or points allowed have a stronger relationship with wins in the NBA? Which variable has the strongest relationship with runs scored in baseball, batting average or home runs? Pick two explanatory variables and one response variable, and begin your investigation by graphing two scatterplots, one for each explanatory variable. Then describe and compare the two scatterplots, including a comparison of the correlations using each explanatory variable. Finally, do a hypothesis test for the variable with the stronger relationship to the response variable to see if the association is significant.
- Do a historical study that looks at changes in the correlation between two variables over time. For example, what has happened to the correlation between the amount of money a team pays its players and the number of wins the team has had over the last 50 years in Major League Baseball?
- How do quarterbacks age? How do pitchers age? How do point guards age? Pick a player and make a time plot of his or her career *PERFORMANCES*. Then pick a sample of comparable players and make a time plot of the average *PERFORMANCES* of these players. How does the time plot of your chosen player compare to the average of other players?