Chapter 2
Sections 2.4 Homework – Answers

Exercises: 2.99*, 2.100*, 2.109*

2.99 Does herbal tea help nursing-home residents? A group of college students believes that herbal tea has remarkable powers. To test this belief, they make weekly visits to a local nursing home, where they visit with the residents and serve them herbal tea. The nursing-home staff reports that after several months many of the residents are healthier and more cheerful. We should commend the students for their good deeds but doubt that herbal tea helped the residents. Identify the explanatory and response variables in this informal study. Then explain what lurking variables account for the observed association.

Solution

2.99. The explanatory and response variables were “consumption of herbal tea” and “cheerfulness/health.” The most important lurking variable is social interaction; many of the nursing home residents may have been lonely before the students started visiting.

2.100 Price and ounces. In Example 2.2 (page 80) and Exercise 2.3 (page 82) we examined the relationship between the price and the size of a Mocha Frappuccino®. The 12-ounce Tall drink costs $3.50, the 16-ounce Grande is $4.00, and the 24-ounce Venti is $4.50.

(a) Plot the data and describe the relationship. (Explain why you should plot size in ounces on the x axis.)
(b) Find the least-squares regression line for predicting the price using size. Add the line to your plot.
(c) Draw a vertical line from the least-squares line to each data point. This gives a graphical picture of the residuals.
(d) Find the residuals and verify that they sum to zero.
(e) Plot the residuals versus size. Interpret this plot.

Solution

2.100. See also the solutions to Exercises 2.3 and 2.9. (a) Size should be on the horizontal axis because it is the explanatory variable. (b) The regression line is $\hat{y} = 2.6071 + 0.08036x$. (c) See the plot (next page). (d) Rounded to four decimal places, the residuals (as computed by software) are $-0.0714$, $0.1071$, and $-0.0357$. It turns out that these three residuals add up to 0, no matter how much they are rounded. However, if they are computed by hand, and the slope and intercept in the regression equation have been rounded, there might be some round-off error. (e) The middle residual is positive and the other two are negative, meaning that the 16-ounce drink costs more than the predicted value and the other two sizes cost less than predicted. Note that the residuals show the same pattern (relative to a horizontal line at 0) as the original points around the regression line.
2.109 Golf scores. Here are the golf scores of 61 members of a women’s golf team in first two rounds of NCAA Tournament play:

<table>
<thead>
<tr>
<th>Player</th>
<th>Gulyanamitta</th>
<th>Hernandez</th>
<th>Hoffmeister</th>
</tr>
</thead>
<tbody>
<tr>
<td>Round 1</td>
<td>80</td>
<td>74</td>
<td>76</td>
</tr>
<tr>
<td>Round 2</td>
<td>76</td>
<td>72</td>
<td>76</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Player</th>
<th>LeBlanc</th>
<th>Mess</th>
<th>Sinha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Round 1</td>
<td>76</td>
<td>85</td>
<td>88</td>
</tr>
<tr>
<td>Round 2</td>
<td>77</td>
<td>83</td>
<td>83</td>
</tr>
</tbody>
</table>

(a) Plot the data with the Round 1 scores on the x axis and the Round 2 scores on the y axis.
(b) Describe the relationship.
(c) Calculate the least-squares regression line and add it to your plot.
(d) Circle the observation for Maria Hernandez. She was the NCAA champion in this tournament.

Solution

2.109. (a) Scatterplot on the right. (b) The plot shows a strong positive linear relationship. (c) The regression equation is $\hat{y} = 20.40 + 0.7194x$. (d) Hernandez’s point is in the lower left—a logical place for the eventual champion.