1. Colleges often rely heavily on raising money for an “annual fund” to support operations. Alumni are typically solicited for donations to the annual fund, and studies suggest that annual income of an alum is a good predictor of the amount of money he or she would be willing to donate, and there is a reasonably strong, positive linear relationship between these variables. In the studies described,
   a. annual income is an explanatory variable.
   b. the correlation between “alum income” and “size of alum’s donation” is positive.
   c. size of alum’s donation to the annual fund is the response variable.
   * d. All of the above

2. Do taller restaurant servers receive larger tips? In a study, the amount of each tip (measured as a percentage of the bill) was recorded, along with the heights of the servers. The response variable is
   * a. the size of the tip.
   b. the height of the server.
   c. the number of servers used in the study.
   d. None of the above

Use the following to answer Questions 3 and 4.

The volume of oxygen consumed (in liters per minute) while a person is at rest and while he or she is exercising (running on a treadmill) was measured for each of 50 subjects. The goal is to determine if the volume of oxygen consumed during aerobic exercise can be estimated from the amount consumed at rest. The results are plotted below.
3. In this study, the explanatory variable is
*  a. the volume of oxygen consumed at rest.
   b. the volume of oxygen consumed while running.
   c. the measuring instrument used to measure the volume of oxygen consumed.
   d. It doesn’t matter which is considered the response. Either variable is appropriate.

4. The scatterplot suggests
   a. there is a positive association between the volume of oxygen consumed at rest and while running.
   b. there is an outlier in the plot.
   *  c. Both a and b
   d. Neither a nor b

Use the following information to answer Questions 5-10.

In a study, nine tires of a particular brand were driven on a track under identical conditions. Each tire was driven a particular controlled distance (measured in thousands of miles), and afterward the tread depth was measured. Tread depth is measured in “mils.” Here, 1 mil is 0.001 inch. The least-squares regression line was computed, and added to a scatterplot of these data. On the plot, one data point is marked with an “X”. This data point will be referenced in Question 8.

The equation of the least-squares regression line is:

\[ \text{Tread Depth} = 360.64 - 11.39x \text{ (thousands of miles)} \]

Also, \( r^2 = 0.953 \).
5. We might feel comfortable using the least-squares regression equation to predict tread depth for a tire driven  
   * a. roughly between 0 and 30 thousand miles.  
   b. roughly between 0 and 50 thousand miles.  
   c. more than 50 thousand miles.  
   d. cannot be determined from the information provided.  

6. What is the predicted tread depth of a tire driven 16 thousand miles? Show your work.  
   178.4 mils.  

7. What is the correlation coefficient r? Show your work.  
   -0.976  

8. The data value marked with “X” in the provided scatterplot has  
   * a. a negative value for the residual.  
   b. a positive value for the residual.  
   c. a zero value for the residual.  
   d. a zero value for the correlation.  

9. The amount of miles driven on the tire is  
   a. the intercept.  
   b. the slope.  
   * c. the explanatory variable.  
   d. the response variable.  

10. Which of the following statements is true?  
    a. The scatter plot shows a negative association between x and y.  
    b. According to the least-squares regression line, the groove depth of a new tire (driven 0 miles) is predicted to be 360.64 mils.  
    c. According to the least-squares regression line, we would predict a decrease in groove depth of 11.39 mils for each 1000 miles driven on a tire.  
    * d. All of the above  

Use the following information to answer Questions 11—13.  

The following table describes the opinions of the 570 people that returned the questionnaire in the survey. Students were classified by class (freshman, sophomore, junior, or senior), and by their opinion of campus residence quality (high quality, medium quality, low quality).  

<table>
<thead>
<tr>
<th>Class</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>65</td>
<td>25</td>
<td>20</td>
<td>110</td>
</tr>
<tr>
<td>Sophomore</td>
<td>55</td>
<td>30</td>
<td>45</td>
<td>130</td>
</tr>
<tr>
<td>Junior</td>
<td>60</td>
<td>40</td>
<td>70</td>
<td>170</td>
</tr>
<tr>
<td>Senior</td>
<td>30</td>
<td>60</td>
<td>70</td>
<td>160</td>
</tr>
<tr>
<td>Total</td>
<td>210</td>
<td>155</td>
<td>205</td>
<td>570</td>
</tr>
</tbody>
</table>
11. What percent of seniors feel that the quality of campus residences is *medium*? Show your work.

37.5%

12. What percent of all students are sophomores?

22.8%

13. Of the students that feel campus residences are of high quality, what percent are seniors?

14.3%

14. Fill in the blank.
Data on 326 death penalty cases were analyzed with regard to the race of the defendant, the race of the victim, and whether the defendant was convicted of murder. It was found that a higher percent of white defendants was sentenced to death overall, but for both black and white victims, a higher percentage of black defendants was sentenced to death.
This apparent contradiction is an example of *Simpson’s paradox*.

15. The list of 12 hotels is given:

<table>
<thead>
<tr>
<th>01 Beach Castle</th>
<th>04 Holiday Inn</th>
<th>07 Sea Castle</th>
<th>10 Tropical Breeze</th>
</tr>
</thead>
<tbody>
<tr>
<td>02 Best Western</td>
<td>05 Lime Tree</td>
<td>08 Sea Club</td>
<td>11 Tropical Shores</td>
</tr>
<tr>
<td>03 Cabana</td>
<td>06 Outrigger</td>
<td>09 Sea Grape</td>
<td>12 Veranda</td>
</tr>
</tbody>
</table>

Use the random digits provided to select an SRS of 3 hotels.

45740 41807 65561 33302 07051 93623 18132 09547

Write the names of the hotel in the simple random sample

Holiday Inn, Best Western, and Sea Castle

Use the following to answer questions 16–17.

To assess the opinion of students at the University of Pittsburgh about campus safety, a reporter for the student newspaper interviews 15 students she can meet easily in front of Student Union.

16. The sample is
   a. all those students walking on campus late at night.
   b. all students at universities with safety issues.
   * c. the 15 students interviewed.
   d. all students approached by the reporter.
17. The method of sampling used is
   a. simple random sampling.
   b. the Gallup Poll.
   * c. convenience sampling.
   d. a census.

Use the following to answer Questions 18.

Advice columnist Ann Landers once asked her readers with children to answer the following question: “If you had it to do over again, would you have children?” Readers were invited to send a response to this question by mail. Of the approximately 10,000 responses Landers received, approximately 70% said “no.”

18. The sample
   a. is probably representative of all parents.
   * b. is probably not representative of all parents because people who feel very strongly about this issue are more likely to respond than people who do not.
   c. has little bias since more than 10,000 people responded, yielding a very large sample.
   d. is probably not representative because more than 10,000 people responded.

19. A public opinion poll in Ohio wants to determine whether registered voters in the state approve of a measure to ban smoking in all public areas. The researchers select a simple random sample of 50 registered voters from each county in the state and ask whether they approve or disapprove of the measure. This is an example of
   a. a systematic county sample.
   * b. a stratified sample.
   c. a multistage sample.
   d. a simple random sample.

20. I toss a penny and observe whether it lands heads up or tails up. Suppose the penny is fair, that is, the probability of heads is 1/2 and the probability of tails is 1/2. This means
   a. every occurrence of a head must be balanced by a tail in one of the next two or three tosses.
   * b. if I flip the coin many, many times, the proportion of heads will be approximately 1/2, and this proportion will tend to get closer and closer to 1/2 as the number of tosses increases.
   c. regardless of the number of flips, half will be heads and half tails.
   d. All of the choices are correct.

21. According to the Current Population Survey, the following table summarizes probabilities for randomly selecting a full-time student in various age groups:

<table>
<thead>
<tr>
<th>Age</th>
<th>15–17</th>
<th>18–24</th>
<th>25–34</th>
<th>35 or older</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.007</td>
<td>0.573</td>
<td>0.260</td>
<td>0.160</td>
</tr>
</tbody>
</table>

If we randomly select a full-time student, what is the probability that he/she is NOT in the age group of 18–24? Show your work.

0.427