MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Classify the variable as qualitative or quantitative.
1) the number of calls received at a company’s help desk
   A) qualitative          B) quantitative

Determine whether the quantitative variable is discrete or continuous.
2) the cholesterol levels of a group of adults the day after Thanksgiving
   A) discrete          B) continuous

Determine the level of measurement of the variable.
3) the native language of a tourist
   A) interval          B) ordinal          C) ratio          D) nominal

Determine whether the study depicts an observational study or an experiment.
4) A pollster obtains a sample of students and asks them how they will vote on an upcoming referendum.
   A) observational study          B) experiment

Determine what type of observational study is described. Explain.
5) A researcher wanted to determine whether women with children are more likely to develop anxiety disorders than women without children. She selected a sample of 900 twenty-year old women and followed them for a twenty-year period. At the start of the study, none of the women had children. By the end of the study 53% of the women had at least one child. The level of anxiety of each participant was evaluated at the beginning and at the end of the study and the increase (or decrease) in anxiety was recorded. The researchers analyzed the results to determine whether there was an association between anxiety and having children.
   A) cross-sectional; Information is collected at a specific point in time.
   B) retrospective; Individuals are asked to look back in time.
   C) cohort; Individuals are observed over a long period of time.

Provide an appropriate response.
6) The policy committee at State University has 6 members: John, Prof. Rise, Dr. Hernandez, LaToyna, Ming, and Jose. A subcommittee of two members must be formed to investigate the visitation policy in the dormitories. List all possible simple random samples of size 2.
   A) John and Prof. Rise, Dr. Hernandez and LaToyna, Ming and Jose
   B) John and Prof. Rise, Prof. Rise and Dr. Hernandez, Dr. Hernandez and LaToyna, LaToyna and Ming, Ming and Jose
   C) John and Prof. Rise, John and Dr. Hernandez, John and LaToyna, John and Ming, John and Jose, Prof. Rise and Dr. Hernandez, Prof. Rise and LaToyna, Prof. Rise and Ming, Prof. Rise and Jose, Dr. Hernandez and LaToyna, Dr. Hernandez and Ming, Dr. Hernandez and Jose, LaToyna and Ming, LaToyna and Jose, Ming and Jose
   D) John and Prof. Rise, John and Dr. Hernandez, John and LaToyna, John and Ming, John and Jose
Determine the sampling technique which is used.

7) At a local technical school, five auto repair classes are randomly selected and all of the students from each class are interviewed. What sampling technique is used?
   A) systematic
   B) stratified
   C) cluster
   D) convenience
   E) random

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Provide an appropriate response.

8) Before opening a new dealership, an auto manufacturer wants to gather information about car ownership and driving habits of the local residents. The marketing manager of the company randomly selects 1000 households from all households in the area and mails a questionnaire to them. Of the 1000 surveys mailed, she receives 70 back. Determine the type of bias.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

9) The object upon which the response variable is measured is called ________.
   A) a treatment
   B) the predictor variable
   C) an experimental unit
   D) the factor

10) Which of the following is not true about factors?
    A) Factors whose effect on the response variable is not of interest can be set after the experiment.
    B) Any combination of the values of the factors is called a treatment.
    C) One way to control factors is to fix their level at one predetermined value throughout the experiment.
    D) Factors whose effect on the response variable interests us should be set at predetermined levels.

11) A drug company wanted to test a new depression medication. The researchers found 700 adults aged 25–35 and randomly assigned them to two groups. The first group received the new drug, while the second received a placebo. After one month of treatment, the percentage of each group whose depression symptoms decreased was recorded and compared. How many levels does the treatment in this experiment have?
    A) 700 (number of respondents)
    B) 2 (medication or placebo)
    C) 10 (age span of respondents)
    D) 1 (months of treatment)

12) A medical journal published the results of an experiment on insomnia. The experiment investigated the effects of a controversial new therapy for insomnia. Researchers measured the insomnia levels of 48 adult women who suffer moderate conditions of the disorder. After the therapy, the researchers again measured the women’s insomnia levels. The differences between the the pre- and post-therapy insomnia levels were reported. How many levels does the treatment have in this experiment?
    A) 2 (pre- and post-therapy)
    B) 96 (the adult women who suffer from insomnia measured pre- and post-therapy)
    C) 48 (the adult women who suffer from insomnia)
    D) 1 (therapy)
A farmer wishes to test the effects of a new fertilizer on her wheat yield. She has four equal-sized plots of land—one with sandy soil, one with rocky soil, one with clay-rich soil, and one with average soil. She divides each of the four plots into three equal-sized portions and randomly labels them A, B, and C. The four A portions of land are treated with her old fertilizer. The four B portions are treated with the new fertilizer, and the four C’s are treated with no fertilizer. At harvest time, the wheat yield is recorded for each section of land. How many levels does the treatment have in this experiment?

A) 3 (old, new, or no fertilizer)  
B) 4 (rocky, sandy, clay, or average soil)  
C) 1 (wheat yield)  
D) 12 (sections of land)

A medical journal published the results of an experiment on anxiety. The experiment investigated the effects of a controversial new therapy for anxiety. Researchers measured the anxiety levels of 52 adult women who suffer moderate conditions of the disorder. After the therapy, the researchers again measured the women’s anxiety levels. The differences between the the pre- and post-therapy anxiety levels were reported. How many levels does the treatment have in this experiment?

A) 104 (the adult women who suffer from anxiety measured pre- and post-therapy)  
B) 1 (therapy)  
C) 52 (the adult women who suffer from anxiety)  
D) 2 (pre- and post-therapy)

A farmer wishes to test the effects of a new fertilizer on her corn yield. She has four equal-sized plots of land—one with sandy soil, one with rocky soil, one with clay-rich soil, and one with average soil. She divides each of the four plots into three equal-sized portions and randomly labels them A, B, and C. The four A portions of land are treated with her old fertilizer. The four B portions are treated with the new fertilizer, and the four C’s are treated with no fertilizer. At harvest time, the corn yield is recorded for each section of land. How many levels does the treatment have in this experiment?

A) 3 (old, new, or no fertilizer)  
B) 1 (corn yield)  
C) 12 (sections of land)  
D) 4 (rocky, sandy, clay, or average soil)

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Provide an appropriate response. Round relative frequencies to thousandths.

The preschool children at Elmwood Elementary School were asked to name their favorite color. The results are listed below. Construct a frequency distribution and a relative frequency distribution.

<table>
<thead>
<tr>
<th>purple</th>
<th>purple</th>
<th>yellow</th>
<th>green</th>
<th>red</th>
<th>red</th>
<th>red</th>
<th>purple</th>
<th>red</th>
<th>yellow</th>
<th>red</th>
<th>yellow</th>
<th>green</th>
<th>green</th>
<th>green</th>
<th>yellow</th>
<th>red</th>
<th>green</th>
<th>red</th>
<th>blue</th>
</tr>
</thead>
</table>

The preschool children at Elmwood Elementary School were asked to name their favorite color. The results are listed below. Construct a frequency distribution and a relative frequency distribution.
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

The bar graph shows the number of tickets sold each week by the garden club for their annual flower show.

17) How many tickets were sold during week 3?
A) 40 tickets  
B) 19 tickets  
C) 30 tickets  
D) 59 tickets  

18) The pie chart shows the percentage of votes received by each candidate in the student council presidential election. Use the pie chart to answer the question.
A) 34%  
B) 20%  
C) 66%  
D) 14%
SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Provide an appropriate response.

19) A sample of 15 Boy Scouts was selected and their weights (in pounds) were recorded as follows:
   97   120  137  124   117
   108  134  126  123  106
   130  110  100  120  140
   a. Using a class interval width of 10, give the upper and lower boundaries for five class intervals, where the lower boundary of the first class is 95.
   b. Construct a frequency distribution for the data

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

20) For the stem-and-leaf plot below, what are the maximum and minimum entries?

   1 | 0 7
   1 | 6 6 6 7 8 9
   2 | 0 1 1 2 3 4 4 5 6 6
   2 | 7 7 7 8 8 9 9 9
   3 | 0 1 1 2 3 4 4 5 5
   3 | 6 6 6 7 8 8 9 9
   4 | 5 6

   A) max: 45; min: 10  
   B) max: 38; min: 7  
   C) max: 46; min: 10  
   D) max: 47; min: 17

Describe the shape of the distribution.

21) 

   A) skewed to the right  
   B) uniform  
   C) bell shaped  
   D) skewed to the left
Use a time series plot to display the data. Comment on the trend,

22) A transportation engineer wishes to use the following data to illustrate the number of deaths from the collision of passenger cars with motorcycles on a particular highway.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930</td>
<td>12</td>
</tr>
<tr>
<td>1940</td>
<td>17</td>
</tr>
<tr>
<td>1950</td>
<td>22</td>
</tr>
<tr>
<td>1960</td>
<td>21</td>
</tr>
<tr>
<td>1970</td>
<td>16</td>
</tr>
<tr>
<td>1980</td>
<td>13</td>
</tr>
<tr>
<td>1990</td>
<td>11</td>
</tr>
</tbody>
</table>

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

23) Explain what is misleading about the graphic.

A) The horizontal label is incomplete.
B) The vertical scale does not begin at zero.
C) The graphic is not misleading.
D) The trend is depicted in the wrong direction.

Provide an appropriate response.

24) A numerical summary of a population is a

A) Statistic  B) Qualitative response
C) Variable  D) Parameter

25) The median of a data set for a variable is the data value that

A) Lies in the middle of the data when the data is arranged in ascending order.
B) None of these
C) Is the average, that is, the sum of all the data values of the variable divided by the number of observations in the data set?
D) Appears the most often

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

26) The ages of five randomly selected students in the biology department at a private university are 27, 26, 32, 18, and 19. Calculate the sample variance of these ages.
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

27) The scores from a state standardized test have a mean of 80 and a standard deviation of 10. The distribution of the scores is roughly bell shaped. Use the Empirical Rule to find the percentage of scores that lie between 60 and 80.
   A) 95%   B) 34%   C) 47.5%   D) 68%

28) For the following data, approximate the mean number of emails received per day.

<table>
<thead>
<tr>
<th>Emails (per day)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>8–11</td>
<td>15</td>
</tr>
<tr>
<td>12–15</td>
<td>38</td>
</tr>
<tr>
<td>16–19</td>
<td>17</td>
</tr>
<tr>
<td>20–23</td>
<td>31</td>
</tr>
<tr>
<td>24–27</td>
<td>46</td>
</tr>
</tbody>
</table>

A) 18.5   B) 17.5   C) 19.0   D) 20.5

29) For the following data set, approximate the sample standard deviation of emails per day.

<table>
<thead>
<tr>
<th>Emails (per day)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>8–11</td>
<td>18</td>
</tr>
<tr>
<td>12–15</td>
<td>23</td>
</tr>
<tr>
<td>16–19</td>
<td>38</td>
</tr>
<tr>
<td>20–23</td>
<td>47</td>
</tr>
<tr>
<td>24–27</td>
<td>32</td>
</tr>
</tbody>
</table>

A) 4.0 emails   B) 25.8 emails   C) 19.3 emails   D) 5.1 emails

30) Given the following five-number summary, find $Q_3$.

2.9, 5.7, 10.0, 13.2, 21.1.

A) 10.0   B) 21.1   C) 5.7   D) 13.2
Use the scatter diagrams shown, labeled a through f to solve the problem.

31) In which scatter diagram is \( r = -1\)?

A) d  B) f  C) a  D) b

32) Compute the linear correlation coefficient between the two variables and determine whether a linear relation exists.

\[
\begin{array}{c|ccccccc}
  x & -4 & -2 & 5 & 2 & 0 & -1 & 1 \\
  y & 3 & -2 & -14 & -9 & -5 & -4 & -7 \\
\end{array}
\]

A) \( r = -0.885\); no linear relation exists  
B) \( r = -0.995\); linear relation exists  
C) \( r = -0.885\); linear relation exists  
D) \( r = -0.995\); no linear relation exists

33) For a random sample of 30 countries, the linear correlation coefficient between the infant mortality rate and the average number of cars per capita was found to be \( r = -0.717\). What does this imply? Does this suggest that if people buy more cars, this could lower the infant mortality rate? Why or why not? What is a likely lurking variable?
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

34) Is there a relationship between the raises administrators at State University receive and their performance on the job? A faculty group wants to determine whether job rating (x) is a useful linear predictor of raise (y). Consequently, the group considered the straight-line regression model, \( \hat{y} = \beta_0 + \beta_1 x \). Using the method of least squares, the faculty group obtained the following prediction equation, \( \hat{y} = 14,000 + 2,000x \).

Interpret the estimated y-intercept of the line.

A) The base administrator raise at State University is $14,000.
B) For a 1-point increase in an administrator’s rating, we estimate the administrator’s raise to increase $14,000.
C) There is no practical interpretation, since rating of 0 is nonsensical and outside the range of the sample data.
D) For an administrator who receives a rating of zero, we estimate his or her raise to be $14,000.

35) The following data represent the living situation of newlyweds in a large metropolitan area and their annual household income. What percent of people who make between $20,000 and $35,000 per year own their own home?

<table>
<thead>
<tr>
<th>Annual Income</th>
<th>Own home</th>
<th>Rent home</th>
<th>Live w/family</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; $20,000</td>
<td>31</td>
<td>67</td>
<td>89</td>
</tr>
<tr>
<td>$20–$35,000</td>
<td>52</td>
<td>66</td>
<td>69</td>
</tr>
<tr>
<td>$35–$50,000</td>
<td>202</td>
<td>52</td>
<td>30</td>
</tr>
<tr>
<td>$50–$75,000</td>
<td>355</td>
<td>23</td>
<td>4</td>
</tr>
<tr>
<td>&gt; $75,000</td>
<td>524</td>
<td>11</td>
<td>2</td>
</tr>
</tbody>
</table>

A) 36.9%  B) 4.5%  C) 35.3%  D) 27.8%

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

36) The following data represent the living situation of newlyweds in a large metropolitan area and their annual household income. What, if any, association exists between living situation and household income? Discuss the association.

<table>
<thead>
<tr>
<th>Annual Income</th>
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</tr>
<tr>
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<td>202</td>
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<td>30</td>
</tr>
<tr>
<td>$50–$75,000</td>
<td>355</td>
<td>23</td>
<td>4</td>
</tr>
<tr>
<td>&gt; $75,000</td>
<td>524</td>
<td>11</td>
<td>2</td>
</tr>
</tbody>
</table>
Answer Key
Testname: MATH1040TEST1ALL2012PRACTICE

1) B
2) B
3) D
4) A
5) C
6) C
7) C
8) Nonresponse bias
9) C
10) A
11) B
12) A
13) A
14) D
15) A
16) A

<table>
<thead>
<tr>
<th>Color</th>
<th>Frequency</th>
<th>Relative Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>purple</td>
<td>3</td>
<td>0.15</td>
</tr>
<tr>
<td>yellow</td>
<td>4</td>
<td>0.20</td>
</tr>
<tr>
<td>green</td>
<td>5</td>
<td>0.25</td>
</tr>
<tr>
<td>red</td>
<td>7</td>
<td>0.35</td>
</tr>
<tr>
<td>blue</td>
<td>1</td>
<td>0.05</td>
</tr>
</tbody>
</table>

17) C
18) A

b.  

<table>
<thead>
<tr>
<th>Weight (lb)</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>95–104</td>
<td>II</td>
<td>2</td>
</tr>
<tr>
<td>105–114</td>
<td>III</td>
<td>3</td>
</tr>
<tr>
<td>115–124</td>
<td>III</td>
<td>5</td>
</tr>
<tr>
<td>125–134</td>
<td>III</td>
<td>3</td>
</tr>
<tr>
<td>135–144</td>
<td>II</td>
<td>2</td>
</tr>
</tbody>
</table>

20) C
21) D
22)

From 1930 to 1950, there was an increasing trend in the number of collision deaths. Subsequently, there was a decreasing trend.
23) B
24) D
25) A
26)
\[ s^2 = \frac{\sum(x - \bar{x})^2}{n-1} \]
\[ \bar{x} = \frac{\sum x}{n} = \frac{27 + 26 + 32 + 18 + 19}{5} = 24.4 \]
\[ s^2 = \frac{(27 - 24.4)^2 + (26 - 24.4)^2 + (32 - 24.4)^2 + (18 - 24.4)^2 + (19 - 24.4)^2}{5 - 1} \]
\[ = 34.30 \]
27) C
28) C
29) D
30) D
31) C
32) B
33) A negative correlation exists between the infant mortality rate and the number of cars per capita but this is an example of correlation not causation. If people buy more cars, this is unlikely to lead to a decrease in the infant mortality rate. A likely lurking variable is wealth and this lurking variable accounts for the negative correlation. More affluent countries tend to have both more cars per capita and lower infant mortality rates.
34) D
35) D
36) The proportion of home owners increases as the household income increases. The proportions of renters and of those living with family decrease as household income increases.