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

Provide an appropriate response.

1) The table below shows the number of new AIDS cases in the U.S. in each of the years 1989-1994.  

<table>
<thead>
<tr>
<th>Year</th>
<th>New AIDS cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>33,643</td>
</tr>
<tr>
<td>1990</td>
<td>41,761</td>
</tr>
<tr>
<td>1991</td>
<td>43,771</td>
</tr>
<tr>
<td>1992</td>
<td>45,961</td>
</tr>
<tr>
<td>1993</td>
<td>103,463</td>
</tr>
<tr>
<td>1994</td>
<td>61,301</td>
</tr>
</tbody>
</table>

Classify the study as either descriptive or inferential.  
A) Descriptive  
B) Inferential

2) The table below shows the average income by age group for the residents of one town in the year 1998. The average incomes for each age group are estimates based on a sample of size 100 from each group.  

<table>
<thead>
<tr>
<th>Age group</th>
<th>Average income</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-24</td>
<td>$17,180</td>
</tr>
<tr>
<td>25-39</td>
<td>$26,661</td>
</tr>
<tr>
<td>40-54</td>
<td>$32,471</td>
</tr>
<tr>
<td>55-70</td>
<td>$25,960</td>
</tr>
<tr>
<td>Over 70</td>
<td>$18,241</td>
</tr>
</tbody>
</table>

Classify the study as either descriptive or inferential.  
A) Descriptive  
B) Inferential

Answer the question.

3) A magazine publisher mails a survey to every subscriber asking about the quality of its subscription service. The total number of subscribers represents what?  
A) The population  
B) The sample

4) A magazine publisher always mails out a questionnaire six months before a subscription ends. This questionnaire asks its subscribers if they are going to renew their subscriptions. On average, only 10% of the subscribers respond to the questionnaire. Of the 10% who do respond, an average of 44% say that they will renew their subscription. This 10% who respond to the questionnaire are known as what?  
A) The population  
B) The sample

5) An employee at the local ice cream parlor asks three customers if they like chocolate ice cream. Identify the sample and population.  
A) Sample: the customers who like chocolate ice cream; population: all customers  
B) Sample: the 3 selected customers; population: all customers  
C) Sample: all customers; population: the 3 selected customers  
D) Sample: the 3 selected customers; population: the customers who like chocolate ice cream
6) A computer network manager wants to test the reliability of some new and expensive fiber-optic Ethernet cables that the computer department just received. The computer department received 4 boxes containing 10 cables each. The manager does not have the time to test every cable in each box. The manager will choose one box at random and test 2 cables chosen randomly within that box. What is the population?
   A) The one box that was chosen at random from the 4 boxes
   B) 40 cables
   C) The 4 boxes
   D) The 2 cables chosen randomly for testing

7) Identify the study as an observational study or a designed experiment.
   7) At one hospital in 1992, 674 women were diagnosed with breast cancer. Five years later, 88% of the Caucasian women and 83% of the African American women were still alive.
      A) Designed experiment  B) Observational study

8) 400 patients suffering from chronic back pain were randomly assigned to one of two groups. Over a four-month period, the first group received acupuncture treatments and the second group received a placebo. Patients who received acupuncture treatments improved more than those who received the placebo.
      A) Designed experiment  B) Observational study

9) The members of a board of directors have the following roles: president (P), vice president (V), secretary (S), treasury (T), and fundraiser (F). Consider these board members to be a population of interest. List the 10 possible samples (without replacement) of size two from this population of five board members.
   A) S,T  S,F  T,P  T,V  T,S  T,F  F,P  F,V  F,S  F,T

10) The finalists in an essay competition are Lisa (L), Melina (M), Ben (B), Danny (D), Eric (E), and Joan (J). Consider these finalists to be a population of interest. The possible samples (without replacement) of size two that can be obtained from this population of six finalists are as follows.

   If a simple random sampling method is used to obtain a sample of two of the finalists, what are the chances of selecting Lisa and Danny?
   A) \( \frac{2}{15} \)  B) \( \frac{1}{3} \)  C) \( \frac{1}{6} \)  D) \( \frac{1}{15} \)

11) True or false? In simple random sampling, each possible sample is equally likely to be the one obtained.
    A) True  B) False
Classify the data as either qualitative or quantitative.

12) The following table gives the top five movies at the box office this week.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Last week</th>
<th>Movie title</th>
<th>Studio</th>
<th>Box office sales ($ millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/A</td>
<td>Pirate Adventure</td>
<td>Movie Giant</td>
<td>35.2</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Secret Agent Files</td>
<td>G.M.G.</td>
<td>19.5</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Epic Super Hero Team</td>
<td>21st Century</td>
<td>14.3</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>Reptile Ride</td>
<td>Movie Giant</td>
<td>10.1</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>Must Love Cats</td>
<td>Dreamboat</td>
<td>9.9</td>
</tr>
</tbody>
</table>

What kind of data is provided by the information in the second column?
A) Qualitative
B) Quantitative

Classify the data as either discrete or continuous.

13) An athlete runs 100 meters in 10.7 seconds.
A) Discrete
B) Continuous

14) The total number of phone calls a sales representative makes in a month is 425.
A) Discrete
B) Continuous

Tell whether the statement is true or false.

15) A variable whose values are observed by counting something must be a discrete variable.
A) True
B) False

16) A discrete variable can only yield whole-number values.
A) True
B) False

Provide an appropriate response.

17) The data in the following table show the results of a survey of college students asking which vacation destination they would choose given the eight choices shown. Determine the value that should be entered in the relative frequency column for Arizona.

<table>
<thead>
<tr>
<th>Destination</th>
<th>Frequency</th>
<th>Relative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Florida</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>Belize</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Alaska</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>California</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Colorado</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Arizona</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

A) 0.003
B) 0.03
C) 0.06
D) 6

Construct the requested graph.
18) Construct a bar graph for the relative frequencies given.

<table>
<thead>
<tr>
<th>Blood Type</th>
<th>Frequency</th>
<th>Relative Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>22</td>
<td>0.44</td>
</tr>
<tr>
<td>A</td>
<td>19</td>
<td>0.38</td>
</tr>
<tr>
<td>B</td>
<td>6</td>
<td>0.12</td>
</tr>
<tr>
<td>AB</td>
<td>3</td>
<td>0.06</td>
</tr>
</tbody>
</table>

A) Relative Frequency

B) Relative Frequency

C) Relative Frequency
19) Number of Pets: The number of pets per family.
   A) Single-value grouping
   B) Limit grouping
   C) None of these
   D) Cutpoint grouping

20) Exam Scores: The exam scores, rounded to the nearest whole number, of all students in a given math course.
   A) Single-value grouping
   B) Limit grouping
   C) None of these
   D) Cutpoint grouping

21) Wingspan of Cardinal: The wingspan lengths, to the nearest hundredth of a millimeter, of a sample of 35 cardinals.
   A) Limit grouping
   B) None of these
   C) Cutpoint grouping
   D) Single-value grouping

Construct a dotplot for the given data.
22) A manufacturer records the number of errors each workstation makes during the week. The data are as follows.
   6 3 2 5 2 0 2 5 4 2 0 1

Construct a stem-and-leaf diagram for the given data.
23) The midterm test scores for the seventh-period typing class are listed below.
   85 77 93 91 74 65 68 97
   88 59 74 83 85 72 63 79
   A)
   5| 9
   6| 5 8 3
   7| 7 4 4 2 9
   8| 5 8 3 5
   9| 3 1 7
   B)
   5| 9
   6| 3 5 8
   7| 3 5 5 8
   8| 2 4 4 7 9
   9| 1 3 7
24) The diastolic blood pressures for a sample of patients at a clinic were as follows. The measurements are in mmHg.

78  87  91  85  97  102  73  90  102  105
94  85  81  95  77  106  84  101  83  92
79  81  96  88  100  85  89  87  83  90
88  95  78  74  108  85  87  92  97  83

Construct a stem-and-leaf diagram using two lines per stem.

A) 7 | 3 4 7 | 8 7 9 8
    8 | 1 4 3 1 3 3 8 | 7 5 5 8 5 9 7 8 5 7
    9 | 1 0 4 2 0 2 9 | 7 5 6 5 7
10 | 2 2 1 0 10 | 2 2 5 6
    10 | 5 6 8

B) 7 | 8 3 7 7 | 9 8 4
    8 | 7 5 5 1 4 3 1 8 8 | 5 9 7 3 8 5 7 3
    9 | 1 7 0 4 5 2 9 | 6 0 5 2 7
10 | 2 2 1 0 10 | 2 2 5 6
    10 | 1 0 8

A nurse measured the blood pressure of each person who visited her clinic. Following is a relative-frequency histogram for the systolic blood pressure readings for those people aged between 25 and 40. Use the histogram to answer the question. The blood pressure readings were given to the nearest whole number.

25) Approximately what percentage of the people aged 25-40 had a systolic blood pressure reading greater than or equal to 130?

A) 26%  B) 74%  C) 23%  D) 15%
A graphical display of a data set is given. Identify the overall shape of the distribution as (roughly) bell-shaped, triangular, uniform, reverse J-shaped, J-shaped, right skewed, left skewed, bimodal, or multimodal.

26) A relative frequency histogram for the sale prices of homes sold in one city during 2006 is shown below.

![Relative Frequency vs. Sale Price](image1)

A) J-shaped  
B) Right skewed  
C) Reverse J-shaped  
D) Left skewed

27) A relative frequency histogram for the heights of a sample of adult women is shown below.

![Relative Frequency vs. Height](image2)

A) Bell-shaped  
B) Triangular  
C) Left skewed  
D) J-shaped
28) A die was rolled 200 times and a record was kept of the numbers obtained. The results are shown in the relative frequency histogram below.

A) Triangular  
B) J-shaped  
C) Left skewed  
D) Uniform

29) Two dice were rolled and the sum of the two numbers was recorded. This procedure was repeated 400 times. The results are shown in the relative frequency histogram below.

A) Bell-shaped  
B) Right-skewed  
C) Triangular  
D) Left skewed

30) The ages of a group of patients being treated at one hospital for osteoporosis are summarized in the frequency histogram below.

A) Left skewed  
B) Reverse J-shaped  
C) Bell-shaped  
D) Right skewed
Provide an appropriate response.
31) The amount of money, in dollars, that an employee of a bank spent on lunch on six randomly selected days yielded the following data set:

8, 13, 14, 12, 6, 16

Compute \( \left( \sum x_i \right)^2 \) and \( \sum x_i^2 \). Explain the difference between the two quantities.
A) 69 and 4761; \( \left( \sum x_i \right)^2 \) is the sum of the squares of the data, whereas \( \sum x_i^2 \) represents the square of the sum of the data.
B) 4624 and 69; \( \left( \sum x_i \right)^2 \) is the square of the sum of the data, whereas \( \sum x_i^2 \) represents the sum of the squares of the data.
C) 4761 and 865; \( \left( \sum x_i \right)^2 \) is the square of the sum of the data, whereas \( \sum x_i^2 \) represents the sum of the squares of the data.
D) 865 and 4761; \( \left( \sum x_i \right)^2 \) is the sum of the squares of the data, whereas \( \sum x_i^2 \) represents the square of the sum of the data.

Find the range for the given data set.
32) Jeanne is currently taking college economics. The instructor often gives quizzes. On the past five quizzes, Jeanne got the following scores.

5 19 3 14 9

A) 3  B) 4  C) 19  D) 16

Find the sample standard deviation for the given data. Round your final answer to one more decimal place than that used for the observations.
33) 2, 6, 15, 9, 11, 22, 1, 4, 8, 19

A) 7.1  B) 2.1  C) 6.3  D) 6.8

Solve the problem.
34) The heights of the adults in one town have a mean of 67.3 inches and a standard deviation of 3.5 inches. What can you conclude from Chebyshev's rule about the percentage of adults in the town whose heights are between 56.8 and 77.8 inches?

A) The percentage is at most 89%  B) The percentage is at least 99.7%
C) The percentage is at most 99.7%  D) The percentage is at least 89%

Use the empirical rule to solve the problem.
35) The systolic blood pressure of 18-year-old women is a roughly bell-shaped distribution with a mean of 120 mmHg and a standard deviation of 12 mmHg. What percentage of 18-year-old women have a systolic blood pressure between 96 mmHg and 144 mmHg?

A) 95%  B) 68%  C) 99.99%  D) 99.7%

Determine the quartile or interquartile range as specified.
36) Find \( Q_3 \).

1, 4, 6, 7, 9, 1, 4, 6, 7, 9

A) 9  B) 7.5  C) 6  D) 7
37) Determine the interquartile range.

\[2, 4, 5, 8, 9, 11, 2, 4, 5, 8, 9, 11\]

A) 4  B) 5  C) 4.5  D) 5.5

Obtain the five-number summary for the given data.

38) 2, 3, 5, 8, 10

A) 2, 2, 5, 10, 10  B) 2, 2.5, 5, 7.5, 10  C) 2, 3.5, 5, 8.5, 10  D) 2, 3, 5, 8, 10

Identify potential outliers, if any, for the given data.

39) The test scores of 15 students are listed below.

\[33, 43, 51, 65, 66\]
\[68, 70, 72, 74, 76\]
\[79, 82, 87, 90, 99\]

A) 33  B) 33, 43  C) 33, 99  D) None

Construct and interpret a boxplot or a modified boxplot as specified.

40) The ages of the 21 members of a track and field team are listed below. Construct a modified boxplot for the data.

\[15, 18, 18, 19, 22, 23, 24\]
\[24, 24, 24, 25, 26, 26, 27\]
\[28, 28, 30, 32, 33, 40, 42\]

A) The data is roughly symmetrical, possibly bell-shaped, with no outliers.

B) The data is roughly symmetrical with one potential outlier.

C) The data is roughly symmetrical with two potential outliers.

D) The data is roughly symmetrical with three potential outliers.
Solve the problem.

41) The boxplots display case prices (in dollars) of white wines produced by three vineyards in the western United States. Describe these wine prices.

- **A)** Vineyards A and B have about the same average price; the boxplots show similar medians and similar IQRs. Vineyard C has higher prices except for one potential outlier, and less variation in pricing as shown by the smaller IQR and overall range. All three distributions are roughly symmetric.

- **B)** Vineyards A and B have about the same average price; the boxplots show similar medians and similar IQRs. Vineyard C has consistently higher prices except for one potential outlier, but more variation in pricing as shown by the larger IQR. The distributions for A and B are approximately symmetric, while the distribution for C is right-skewed.

- **C)** Vineyards A and B have about the same average price; the boxplots show similar medians and similar IQRs. Vineyard C has higher prices except for one potential outlier, and a less variation in pricing as shown by the smaller IQR and overall range. Distributions A and B are approximately symmetric, while distribution C is right-skewed.

- **D)** Vineyards A and B have different average prices, but a similar variation. Vineyard C has lower prices except for one potential outlier, and less variation in pricing as shown by the smaller IQR. The distributions for A and B are approximately symmetric, while the distribution for C is right-skewed.

Provide an appropriate response.

42) Find the population standard deviation. Round to one decimal place as needed.

0, -1, 5, 6

- **A)** 1.7
- **B)** 3
- **C)** 9.3
- **D)** 7.5
43) Jason and Alex were the top two players in a tennis tournament. They dominated the competition with a record number of aces (an ace is a valid serve that could not be returned by an opponent). The following table provides the number of aces served by each of the two players during the five sets:

<table>
<thead>
<tr>
<th>Jason</th>
<th>3 4 3 3 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alex</td>
<td>6 5 2 3 1</td>
</tr>
</tbody>
</table>

(i) Without doing any calculations, decide for which player the standard deviation of the number of aces is smaller. Explain.
(ii) Find the individual population standard deviations of the number of aces. Round your final answer to two decimal places. Compare these answers with part (i).

A) (i) The spread of the values appears to be smaller for Jason, so he is likely to have the smaller standard deviation.
   (ii) Jason's population standard deviation is 0.77; Alex's population standard deviation is 1.93, so Jason did have the smaller standard deviation.
B) (i) The spread of the values appears to be smaller for Alex, so he is likely to have the smaller standard deviation.
   (ii) Jason's population standard deviation is 0.94; Alex's population standard deviation is 0.12, so Alex did have the smaller standard deviation.
C) (i) The spread of the values appears to be smaller for Alex, so he is likely to have the smaller standard deviation.
   (ii) Jason's population standard deviation is 1.32; Alex's population standard deviation is 1.01, so Alex did have the smaller standard deviation.
D) (i) The spread of the values appears to be smaller for Jason, so he is likely to have the smaller standard deviation.
   (ii) Jason's population standard deviation is 0.49; Alex's population standard deviation is 1.85, so Jason did have the smaller standard deviation.

Solve the problem.
44) Scores on a test have a mean of 73 and a standard deviation of 11. Michelle has a score of 62.
   Convert Michelle’s score to a z-score.
   A) -11   B) 11   C) -1   D) 1

Provide an appropriate response.
45) Which is better, a score of 92 on a test with a mean of 71 and a standard deviation of 15, or a score of 688 on a test with a mean of 493 and a standard deviation of 150? (Assume that the distributions being compared have approximately the same shape.)
   A) A score of 688
   B) A score of 92
   C) Both scores have the same relative position.
46) For the linear equation \( y = -9 - 8.7x \), explain what the \( y \)-intercept and slope represent in terms of the graph of the equation.

A) The \( y \)-intercept, \( b_0 = -9 \), gives the \( y \)-value at which the straight line \( y = -9 - 8.7x \) intersects the \( x \)-axis. The slope, \( b_1 = -8.7 \), indicates that the \( x \)-value decreases by 8.7 units for every increase in \( y \) of 1 unit.

B) The \( y \)-intercept, \( b_0 = -9 \), gives the \( y \)-value at which the straight line \( y = -9 - 8.7x \) intersects the \( y \)-axis. The slope, \( b_1 = 8.7 \), indicates that the \( y \)-value increases by 8.7 units for every increase in \( x \) of 1 unit.

C) The \( y \)-intercept, \( b_0 = -8.7 \), gives the \( y \)-value at which the straight line \( y = -9 - 8.7x \) intersects the \( y \)-axis. The slope, \( b_1 = -9 \), indicates that the \( y \)-value decreases by 9 units for every increase in \( x \) of 1 unit.

D) The \( y \)-intercept, \( b_0 = -9 \), gives the \( y \)-value at which the straight line \( y = -9 - 8.7x \) intersects the \( y \)-axis. The slope, \( b_1 = -8.7 \), indicates that the \( y \)-value decreases by 8.7 units for every increase in \( x \) of 1 unit.

47) Is the data point, \( P \), an outlier, a potential influential observation, both, or neither?

A) Outlier

B) Both

C) Neither

D) Potential influential observation

48) Use the regression equation to predict the \( y \)-value corresponding to the given \( x \)-value. Round your answer to the nearest tenth.

The regression equation relating dexterity scores (\( x \)) and productivity scores (\( y \)) for ten randomly selected employees of a company is \( ^\wedge y = 5.50 + 1.91x \). Predict the productivity score for an employee whose dexterity score is 24.

A) 133.9

B) 58.2

C) 51.3

D) 56.3
Answer Key
Testname: CHS 1,2,3, 4

1) A
2) B
3) A
4) B
5) B
6) B
7) B
8) A
9) B
10) D
11) A
12) B
13) B
14) A
15) A
16) B
17) B
18) A
19) A
20) D
21) C
22) B
23) A
24) A
25) A
26) B
27) A
28) D
29) C
30) A
31) C
32) D
33) A
34) D
35) A
36) D
37) B
38) D
39) B
40) D
41) C
42) B
43) D
44) C
45) B
46) D
47) B
48) C