Unit tests are written to evaluate student comprehension, acquisition, and synthesis of these skills. The problems listed as Assigned MyStatLab Problems are textbook exercises that appear in the assigned MyStatLab homework. Problems marked with an asterisk (*) are from a supplementary textbook and not the Sullivan text. The problems listed as Additional Suggested Problems are good practice problems which are located in the Sullivan text and can be viewed from the Chapter Contents within MyStatLab. Detailed solutions to the odd-numbered exercises and all solutions to the Chapter Reviews and Chapter Tests can be found in the Student's Solutions Manual under Chapter Contents in MyStatLab.

Chapter 1: Data Collection

<table>
<thead>
<tr>
<th>Section 1.1: Introduction to the Practice of Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Identify the individuals, population, sample, parameter, and statistic in a given study.</td>
</tr>
<tr>
<td>• Decide whether a given study result is an example of descriptive or inferential statistics.</td>
</tr>
<tr>
<td>• Identify the variable or variables of interest in a statistical study.</td>
</tr>
<tr>
<td>• Determine whether a given variable is quantitative or qualitative.</td>
</tr>
<tr>
<td>• Classify a variable according to its level of measurement.</td>
</tr>
</tbody>
</table>

**Assigned MyStatLab Problems:** 5, 7, 9, 15, 17, 31, 33, 40, 45, 50, 51

**Additional Suggested Problems:** 11, 13, 19, 21, 35, 37, 39, 49, 53

<table>
<thead>
<tr>
<th>Section 1.2: Observational Studies versus Designed Experiments</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Determine whether a given study is an observational study or a designed experiment.</td>
</tr>
<tr>
<td>• Understand that observational studies only allow a researcher to claim association and not causation, but experiments can identify cause and effect relationships.</td>
</tr>
</tbody>
</table>

**Assigned MyStatLab Problems:** 2, 9, 11

**Additional Suggested Problems:** 13, 15, 19c, 19e

<table>
<thead>
<tr>
<th>Section 1.3: Simple Random Sampling</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Use a random number generator to select a simple random sample.</td>
</tr>
<tr>
<td>• Recognize that samples which are not randomly selected (such as convenience samples) may not be representative of the population.</td>
</tr>
</tbody>
</table>

**Assigned MyStatLab Problems:** 15

**Additional Suggested Problems:** 5, 7, 9a
Section 1.4: Other Effective Sampling Methods

- Determine whether a sampling method is an example of simple random sampling, stratified sampling, cluster sampling, systematic sampling, or convenience sampling.
- Identify the advantages other effective sampling methods (stratified, cluster, and systematic) can have over simple random sampling.

**Assigned MyStatLab Problems:** 11, 13, 19, 21, 22

**Additional Suggested Problems:** 14, 15, 16, 17, 18, 20

Section 1.5: Bias in Sampling

- Recognize sampling bias, nonresponse bias, and response bias.
- Describe how the bias in a particular study may impact estimation of the parameter of interest.

**Assigned MyStatLab Problems:** 5, 7, 9, 25

**Additional Suggested Problems:** Chapter 1 Test #17a-d

Section 1.6: The Design of Experiments

- Identify the response variable, factor, treatments, and subjects in a designed experiment.
- Explain how a control group, randomization, blinding, and replication are incorporated in an experiment, and describe the advantages of including these elements in an experiment.
- Determine whether a completely randomized design was used in a given experiment.
- Draw a diagram to illustrate an experiment with a completely randomized design.

**Assigned MyStatLab Problems:** 1, 2, 3, 5, 9, 13, 19

**Additional Suggested Problems:** Chapter 1 Test #19a-g
Chapter 2: Summarizing Data in Tables and Graphs

Section 2.1: Organizing Qualitative Data

- Construct the frequency distribution and relative frequency distribution for a qualitative data set.
- Create a bar graph or Pareto chart for a set of qualitative data by hand or using JMP.
- Determine the number (or proportion) of individuals in each category from a bar chart or pie chart.

Assigned MyStatLab Problems: 5, 11, 13, 24, 34

Additional Suggested Problems: 7, 21, 26

Section 2.2: Organizing Quantitative Data

- List which graphical displays are appropriate for qualitative variables and which graphical displays are appropriate for quantitative variables.
- Create a dot plot, a stem-and-leaf plot, or a histogram for a set of quantitative data by hand or using JMP.
- List which graphs are appropriate for small quantitative data sets and which are best for large quantitative data sets.
- Determine the number (or proportion) of individuals in a particular range from a given dot plot, stem-and-leaf plot, or histogram.
- Describe the shape of the distribution of a quantitative variable.

Assigned MyStatLab Problems: 6, 7, 9, 39, 41, 53, 59

Additional Suggested Problems: 10, 35, 45, 54

Chapter 3: Numerically Summarizing Data

Section 3.1: Measures of Central Tendency

- Calculate the mean and median for a set of quantitative data.
- Explain what it means for a numerical summary measure to be resistant.
- Understand that the median better represents a typical value for a distribution when the data contains outliers because the median is resistant and the mean is not resistant.
- Describe how the mean and median are related for different shapes of a distribution (symmetric, skewed left, or skewed right).

Assigned MyStatLab Problems: 3, 17, 25, 27, 32, 35

Additional Suggested Problems: 18, 19, 30
### Section 3.2: Measures of Dispersion

- Calculate the range, variance, and standard deviation for a set of quantitative data.
- Understand that samples with greater variability will have larger standard deviations, and that when all observations are the same value the standard deviation is equal to zero.
- Give the correct unit of measurement for the variance and the standard deviation of a given set of quantitative data.
- Use the Empirical Rule to describe bell-shaped distributions.

**Assigned MyStatLab Problems:** 3, 15, 17, 23, 31

**Additional Suggested Problems:** 21, 25, 29, 32

### Section 3.4: Measures of Position & Methods for Detecting Outliers

- Calculate and interpret the $z$-score for an observation from a bell-shaped distribution with a given mean and standard deviation.
- Describe the position of a given percentile or quartile value relative to the other values in a set of observations.
- Determine the quartiles and the interquartile range for a set of quantitative data.
- Understand that for skewed distributions, IQR is the preferred measure of spread because IQR is a resistant statistic and standard deviation is not a resistant statistic.
- Use the $1.5 \times \text{IQR}$ rule to determine if a set of quantitative data contains potential outliers.

**Assigned MyStatLab Problems:** 11, 16, 17, 21, 31, 39

**Additional Suggested Problems:** 7, 15, 23

### Section 3.5: The Five-Number Summary & Boxplots

- Determine the five-number summary for a set of quantitative data.
- Construct a boxplot for a set of quantitative data and identify the shape of the distribution.
- Use JMP to find relevant summary statistics for a set of quantitative data.
- Describe a distribution of quantitative data by discussing its shape, providing an appropriate measure of center, and providing an appropriate measure of spread.
- Compare two distributions by discussing the similarities and/or differences in their shapes, their centers, and their spreads with reference to the numerical values of appropriate summary measures.

**Assigned MyStatLab Problems:** 3, 5, 12,*3.1, 30, *4.1.31, 16, 18

**Additional Suggested Problems:** 13, Chapter 3 Review #9-10; Chapter 3 Test #8
Chapter 4: Describing the Relation between Two Quantitative Variables

### Section 4.1: Scatter Diagrams & Correlation

- Identify the response variable and explanatory variable in a given study.
- Draw and interpret scatter diagrams.
- Know the properties of the linear correlation coefficient.
- Find and interpret the linear correlation coefficient between two quantitative variables.
- Determine whether a linear relation exists between two variables.
- Recognize that correlation does not imply causation.
- Identify lurking variables that may be present in a study.

**Assigned MyStatLab Problems:** 13, 14, 25, 40, 49

**Additional Suggested Problems:** 15, 21, 27, 29, 41

### Section 4.2: Least-Squares Regression

- Find the least-squares regression line and use it to make predictions.
- Recognize that the least-squares regression equation should not be used to extrapolate beyond the range of observed $x$-values.
- Interpret the slope and the $y$-intercept of the least-squares regression line.
- Calculate the residual for a given $x$ value.
- Identify the correlation coefficient and least-squares regression equation from JMP output.

**Assigned MyStatLab Problems:** 19, 21

**Additional Suggested Problems:** 17, Chapter 3 Test #1a-i
### Chapter 5: Probability

#### Sections 5.1: Probability Rules

- Understand that the probability of a particular outcome is the proportion of times the outcome would occur in a long run of observations.
- List the sample space of a given probability experiment.
- Determine if a set of probabilities is legitimate by checking that the probability of any event is a number between 0 and 1 and that the sum of the probabilities for all simple events in the sample space equals 1.
- Identify events that are impossible, certain, and unusual from their probabilities.
- Find probabilities for events in probability experiments with equally likely outcomes.
- Compute probabilities using the empirical approach.

**Assigned MyStatLab Problems:** 7, 9, 11, 13, 17, 19, 25, 31, 33, 45, 49

**Additional Suggested Problems:** 29, 37, 39, 41, 43

#### Section 5.5: Counting Techniques

- Identify if sampling is done with or without replacement, and when order is important and when order is not important in a given probability experiment.
- Use the Multiplication Rule of Counting and the Combinations Rule to determine the number of outcomes in a probability experiment.

**Assigned MyStatLab Problems:** 19, 29, 31, 33, 43, 45, 51

**Additional Suggested Problems:** 7, 21, 25, 37, 47, 49, 50