**Think About a Plan**

**Permutations and Combinations**

**Consumer Issues** A consumer magazine rates televisions by identifying two levels of price, five levels of repair frequency, three levels of features, and two levels of picture quality. How many different ratings are possible?

**Understanding the Problem**

1. How many levels of price are possible?
2. How many levels of repair frequency are possible?
3. How many levels of features are possible?
4. How many levels of picture quality are possible?
5. What is the problem asking you to determine?

**Planning the Solution**

6. What is the Fundamental Counting Principle?

7. How can the Fundamental Counting Principle help you solve the problem?

**Getting an Answer**

8. Write an expression for the number of different ratings that are possible.

9. How many different ratings are possible?
11-3  Think About a Plan  
Probability of Multiple Events

Marbles  A jar contains four blue marbles and two red marbles. Suppose you choose a marble at random, and do not replace it. Then you choose a second marble. Find the probability that you select a blue marble and then a red marble.

Understanding the Problem
1. How many marbles are blue?

2. How many marbles are red?

3. How many marbles are in the jar?

4. What is the problem asking you to determine?

Planning the Solution
5. What is the probability that you choose a blue marble from the jar?

6. Assuming you choose a blue marble and do not replace it, how many marbles of each color remain in the jar? What is the total number of marbles in the jar?

7. What is the probability that you now choose a red marble from the jar?

8. How can you find the probability that you select a blue marble and then a red marble?

Getting an Answer
9. What is the probability that you select a blue marble and then a red marble?
11-4 Think About a Plan
Conditional Probability

Transportation. You can take Bus 65 or Bus 79. You take the first bus that arrives. The probability that Bus 65 arrives first is 75%. There is a 40% chance that Bus 65 picks up passengers along the way. There is a 60% chance that Bus 79 picks up passengers. Your bus picked up passengers. What is the probability that it was Bus 65?

Understanding the Problem
1. What is the probability that Bus 65 arrives first?

2. What is the probability that Bus 65 picks up passengers?

3. What is the probability that Bus 79 picks up passengers?

4. What is the problem asking you to determine?

Planning the Solution
5. Let $E_{65} = \text{Bus 65 arrived first, } B_{79} = \text{Bus 79 arrived first, } P = \text{passengers, } NP = \text{no passengers.}$ What conditional probability are you looking for?

6. How can a tree diagram help you solve the problem?

7. Write an equation you can use to find the probability that your bus was Bus 65.

Getting an Answer
8. Make a tree diagram for this problem.

9. Which two branches of the diagram show a bus picking up passengers?

10. What is the probability your bus was Bus 65?
Use the table to find each probability.

1. \( P(\text{has less than high school education}) \)

2. \( P(\text{earns over $30,000 and} \ \text{has less than high school education}) \)

3. \( P(\text{earns over $30,000 | has} \ \text{only high school education}) \)

4. \( P(\text{has high school education or less | earns over $30,000}) \)

Use the table below to find each probability. The table gives information about students at one school.

**Favorite Leisure Activities**

<table>
<thead>
<tr>
<th></th>
<th>Sports</th>
<th>Hiking</th>
<th>Reading</th>
<th>Phoning</th>
<th>Shopping</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>39</td>
<td>48</td>
<td>65</td>
<td>62</td>
<td>71</td>
<td>29</td>
</tr>
<tr>
<td>Male</td>
<td>67</td>
<td>56</td>
<td>76</td>
<td>54</td>
<td>68</td>
<td>39</td>
</tr>
</tbody>
</table>

5. \( P(\text{sports | female}) \)  
6. \( P(\text{female | sports}) \)

7. \( P(\text{reading | male}) \)  
8. \( P(\text{male | reading}) \)

9. \( P(\text{hiking | female}) \)  
10. \( P(\text{hiking | male}) \)

11. \( P(\text{male | shopping}) \)  
12. \( P(\text{female | shopping}) \)

13. The senior class is 55% female, and 52% of the class are females who play a competitive sport. What is the probability that a student plays a competitive sport, given that the student is female?

14. A softball game has an 80% chance of being cancelled if it rains and a 30% chance of being cancelled if there is fog when there is no rain. There is a 70% chance of fog with no rain and a 30% chance of rain.

a. Make a tree diagram based on the information above.

b. Find the probability that there will be fog and the game will be cancelled.

c. Find the probability that there will be rain and the game will be played.

d. Find the probability that the game will be cancelled.
11.5 Think About a Plan
Analyzing Data

Meteorology  On May 3, 1999, 50 tornadoes hit Oklahoma in the largest tornado outbreak ever recorded in the state. Sixteen of these were classified as strong (F2 or F3) or violent (F4 or F5).

a. Make a box-and-whisker plot of the data for length of path.
b. Identify the outliers. Remove them from the data set and make a revised box-and-whisker plot.
c. Writing How does the removal of the outliers affect the box-and-whisker plot? How does it affect the median of the data set?

1. Arrange the data in increasing order.

2. Minimum value =  
Maximum value =  
Q₁ =  
Q₂ =  
Q₃ =  

3. Use your previous answers to make a box-and-whisker plot of the data for length of path.

4. How can you identify the outliers in the data set?

5. What are the outliers in the data set?

6. Remove the outliers from the data set and make a revised box-and-whisker plot.

7. How does the removal of the outliers affect the box-and-whisker plot?

8. How does the removal of the outliers affect the median of the data set?

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11-6 Practice

Standard Deviation

Find the mean, variance, and standard deviation for each data set.

1. 232 254 264 274 287 298 312 342 308
2. 26 27 28 28 29 30 32 35 35 35
3. 2.2 2.2 2.3 2.4 2.4 2.5 2.5 2.5 2.6
4. 75 73 77 79 79 74 81 74 70 68 70 72

Graphing Calculator Find the mean and the standard deviation.

5. price of XYZ Company stock for the first 12 weeks of 2005

| 5.34 5.40 5.41 5.42 5.50 5.55 |
| 5.35 5.35 5.36 5.36 5.38 5.38 |

6. price of XYZ Company stock for the first 12 weeks of 2009

| 6.00 5.95 5.92 5.80 5.31 5.75 |
| 5.75 5.75 5.64 5.52 5.40 5.03 |

Determine the whole number of standard deviations that includes all data values.

7. The hours students in your study group study is 66.1 min; the standard deviation is 2.9 min.

| 62 63 65 64 68 68 69 72 66 |

8. The mean weight of your pets is 18.25 lb; the standard deviation is 30.1 lb.

| 2.25 2.25 5 16 85 |

9. Use the data for average daily water usage of a family during the past 10 months. Find the mean and the standard deviation of the data. How many items in the data set fall within one standard deviation of the mean? Within two standard deviations?

| 124 gal 113 gal 152 gal 545 gal 150 gal |
| 490 gal 442 gal 207 gal 124 gal 147 gal |

10. Reasoning In Lesson 11-5 an outlier is defined as a value “substantially different from the rest of the data in a set.” How could you use the concept of standard deviation to rewrite this definition?
Multiple Choice

For Exercise 1-4, choose the correct letter.

1. The School Dance Committee conducts a survey to find what type of music students would like to hear at the next dance. Which is an example of a random sample?
   - A. Call 20% of the people in the senior class directory.
   - B. Interview every 10th student as they enter the school.
   - C. Ask every 5th person leaving a school orchestra concert.
   - D. Set up a jazz website where students can list their 3 favorite songs.

2. Which is a characteristic of a biased survey question?
   - A. It is about a controversial issue
   - B. It produces inaccurate results.
   - C. It is about a well-known person.
   - D. It is about a very unpopular person.

3. In a survey, 36% of 1600 students said they spent at least 5 h online during the past week. What is the approximate margin of error for this sample?
   - A. ± 0.6%
   - B. ± 2.5%
   - C. ± 6%
   - D. ± 25%

4. A newspaper surveys a sample of 2500 people and finds that 64% agree with a certain political position. What interval is most likely to contain the percentage of the total population who agree with the position?
   - A. 62-66%
   - B. 62-64%
   - C. 63-65%
   - D. 64-66%

Short Response

5. A city council surveys a sample of citizens about a new law. The survey finds that 38% of citizens think the law should be repealed. The survey has a margin of error of about 8%. About how many people did the council survey? Show your work.
Think About a Plan
Normal Distributions

Agriculture: To win a prize, a tomato must be greater than 4 in. in diameter. The diameters of a crop of tomatoes grown in a special soil are normally distributed, with a mean of 3.2 in. and a standard deviation of 0.4 in. What is the probability that a tomato grown in the special soil will be a winner?

Know
1. A tomato must have a diameter greater than \( \) to win a prize.

2. The mean diameter of the crop of tomatoes is \( \).

3. The standard deviation of the diameters of the crop of tomatoes is \( \).

Need
4. To solve the problem I need to find:

Plan
5. Draw a normal curve. Label the mean and intervals that are multiples of the standard deviation from the mean.

6. What is the percent of the crop with diameters that are greater than the mean?

7. What is the percent of the crop with diameters that are greater than the mean and less than 4 in.? How do you know?

8. How can you find the percent of the crop with diameters greater than 4 in.?

9. What is the probability that a tomato grown in the special soil will be a winner?
The actual weights of bags of pet food are normally distributed about the mean. Use the graph at the right for Exercises 1–6.

1. About what percent of bags of pet food weigh 49.9 lb–50.1 lb?

2. About what percent of bags weigh less than 49.8 lb?

3. In a group of 250 bags, how many would you expect to weigh more than 50.4 lb?

4. The mean of the data is 50, and the standard deviation is 0.2. Approximately what percent of bags are within one standard deviation of the mean weight?

Sketch a normal curve for each distribution. Label the x-axis values at one, two, and three standard deviations from the mean.

5. mean = 95; standard deviation = 12
6. mean = 100; standard deviation = 15
7. mean = 60; standard deviation = 5
8. mean = 23.8; standard deviation = 5.2

A set of data has a normal distribution with a mean of 5.1 and a standard deviation of 0.9. Find the percent of data within each interval.

9. from 4.2 to 5.1
10. from 6.0 to 6.9
11. greater than 6.9

12. The number of miles on a car when a certain part fails is normally distributed, with a mean of 60,000 and a standard deviation of 5000.
   a. Sketch the normal curve for the distribution. Label the x-axis values at one, two, and three standard deviations from the mean.
   b. What is the probability that the part will NOT fail between 55,000 and 65,000 miles?