Answers

4. This cylindrical bucket has a smaller diameter than the cylindrical bucket from Exercise 2. This cylindrical bucket is holding 64 cubic inches of water because that is the volume of the cube bucket. If the cylindrical bucket from Exercise 2 was filled to a height of 7 inches, it would hold about 197.9 cubic inches of water. Because the cylindrical bucket would hold less with the same height, the diameter must be smaller.

5. *Answer should include, but is not limited to:* A picture must be included in which the shapes are labeled with their names, dimensions, and volumes. The total volume of the shapes must be less than or equal to 360 in.^{3}

9.5 Puzzle Time

FRUIT SALAD

Extension 9.5 Start Thinking!

For use before Extension 9.5

Check students' work.

Extension 9.5 Warm Up

For use before Extension 9.5

1. cylinder **2.** rectangular prism

3. pyramid **4.** sphere

Extension 9.5 Practice

1. square **2.** triangle

3. rectangle **4.** triangle

5. point **6.** triangle

7. circle **8.** circle

Technology Connection

1. The surface area is multiplied by a factor of 4.

2. The surface area is multiplied by a factor of 9.

3. The surface area is multiplied by a factor of 16.

4. The surface area is multiplied by a factor of n^2. The formula for the surface area is $S = 6s^2$, so when s is multiplied by n, the formula becomes $S = 6(ns)^2 = n^2 \bullet 6s^2$.

Chapter 10

10.1 Start Thinking!

For use before Activity 10.1

2; 4; 4

10.1 Warm Up

For use before Activity 10.1

1. $\frac{6}{25}$ **2.** $\frac{1}{2}$ **3.** $\frac{4}{5}$

4. $\frac{1}{5}$ **5.** $\frac{3}{5}$ **6.** $\frac{4}{7}$

10.1 Start Thinking!

For use before Lesson 10.1

Answers will vary. Check students' work.

10.1 Warm Up

For use before Lesson 10.1

1. 8 **2.** 4; 4

10.1 Practice A

1. Choosing 4 **2.** Choosing 2, 4, 6, or 8

3. Choosing 1 **4.** Choosing 7 or 9

5. Choosing 2, 4, 6, or 8 **6.** no favorable outcomes

7. a. 3 **b.** Choosing any 1 of the 3 triangles

8. a. 1 **b.** Choosing a star

9. a. 6

b. Choosing a star, choosing any 1 of the 2 circles or 3 triangles

10. a. 5

b. Choosing a star, a square, or any 1 of the 3 triangles

11. a. 22 **b.** 24 **12. a.** 3 **b.** 2

10.1 Practice B

1. Choosing 8 **2.** Choosing 2, 4, or 6

3. Choosing 5 or 7 **4.** no favorable outcomes

5. Choosing 2 or 3 **6.** Choosing 3, 6, 8 or 9

7. a. 1 **b.** Choosing a triangle

8. a. 4 **b.** Choosing any 1 of the 4 stars

Answers

9. a. 8

b. Choosing any 1 of the 4 stars or 3 circles or a triangle

10. a. 8

b. Choosing a triangle or any 1 of the 4 stars or 3 squares

11. a. 12 **b.** 7 **c.** 6 **d.** 5

e. Choosing any 1 of the 4 remaining dogs

10.1 Enrichment and Extension

1. 28 cards

30 stones: 1 by 30, 2 by 15, 3 by 10, 5 by 6

31 stones: 1 by 31

32 stones: 1 by 32, 2 by 16, 4 by 8

33 stones: 1 by 33, 3 by 11

34 stones: 1 by 34, 2 by 17

35 stones: 1 by 35, 5 by 7

36 stones: 1 by 36, 2 by 18, 3 by 12, 4 by 9, 6 by 6

37 stones: 1 by 37

38 stones: 1 by 38, 2 by 19

39 stones: 1 by 39, 3 by 13

40 stones: 1 by 40, 2 by 20, 4 by 10, 5 by 8

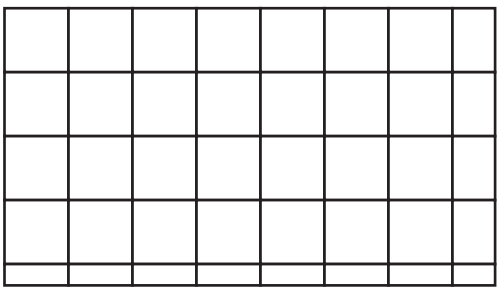
2. a. It is more likely that the ruined card has an even number of square stones in the design because 20 of the cards have an even number of square stones, and only 8 of the cards have an odd number of square stones.

b. It is more likely that the ruined card has more than 35 square stones in the design because 14 of the cards have more than 35 stones, and only 12 of the cards have less than 35 stones.

3. 36 stones; There are 5 different rectangular designs that can be made with 36 stones. This is the most options for 30 to 40 stones.

4. He should buy at least 33 stones. His six options to consider would be 2 by 15, 3 by 10, 5 by 6, 2 by 16, 4 by 8, and 3 by 11.

5. a.



b. He will need to buy 34 stones.

c. He will use 28 whole stones. He will need to cut four of the stones so that each is two pieces, one that is 3 inches wide $\left(\frac{1}{3} \text{ of the length}\right)$ and one that is 6 inches wide $\left(\frac{2}{3} \text{ the length}\right)$. One stone will need to be cut into three pieces that are each 3 inches wide $\left(\frac{1}{3} \text{ the length}\right)$. The last stone will need to be cut into a piece that is 6 inches long $\left(\frac{2}{3} \text{ the length}\right)$ and 3 inches wide $\left(\frac{1}{3} \text{ the length}\right)$.

The only waste will be two blocks cut from this last block, one that is 6 inches by 9 inches and one that is 3 inches by 3 inches.

10.1 Puzzle Time

A VERY LOST CAMEL

10.2 Start Thinking!

For use before Activity 10.2

Your friend has a better chance of rolling a four because he has two dice.

10.2 Warm Up

For use before Activity 10.2

1. no; $\frac{3}{7}$ **2.** no; $\frac{4}{9}$ **3.** yes

4. yes **5.** yes **6.** no; $\frac{1}{2}$

10.2 Start Thinking!

For use before Lesson 10.2

Sample answer: A weather forecaster uses probability when stating the chance of precipitation for each day.

10.2 Warm Up

For use before Lesson 10.2

1. Spinner A is a better choice because you have 2 chances of getting an "Up."

2. No, it does not matter which spinner you use because both spinners have "Reverse" listed only once.

Answers

10.2 Practice A

1. Spinner A; Probability of red is $\frac{1}{2}$ versus $\frac{1}{3}$.

2. Spinner B; Probability of yellow is $\frac{1}{3}$ versus $\frac{1}{6}$.

3. no; Probability of blue is $\frac{1}{3}$ for both spinners.

4. Snow today is impossible.

5. You are likely to make a free throw.

6. It is unlikely that your band marches in the parade.

7. $\frac{1}{5}$ **8.** $\frac{1}{10}$ **9.** $\frac{3}{5}$ **10.** 0

11. 12 games

12. a. 11 **b.** about equally likely

13. a. $\frac{4}{5}$; likely to happen

b. $\frac{1}{2}$; equally likely to happen

c. $\frac{9}{10}$; almost certain to happen

10.2 Practice B

1. unlikely to arrive late

2. certain to rain during a hurricane

3. likely you will go to the concert

4. $\frac{3}{16}$ **5.** $\frac{1}{8}$ **6.** $\frac{3}{4}$ **7.** 1

8. a. 0.50 **b.** 0.50 **c.** 1 prize

9. a. $\frac{1}{2}$ before; $\frac{3}{5}$ after; probability increased

b. $\frac{3}{10}$ before; $\frac{1}{5}$ after; probability decreased

c. $\frac{1}{5}$ before; $\frac{1}{5}$ after; probability stayed the same

10.2 Enrichment and Extension

1. $\frac{1}{4}$ **2.** $\frac{3}{4}$ **3.** $\frac{16}{81}$

4. $\frac{65}{81}$ **5.** $\frac{16}{49}$ **6.** $\frac{33}{49}$

10.2 Puzzle Time

ROCK STAR WHO WENT TO THE COMPUTER STORE SO HE COULD GET A GIG

10.3 Start Thinking!

For use before Activity 10.3

Sample answer: There are a total of 18 marbles in your bag. Six of the marbles are red. The theoretical probability of pulling a red marble is $\frac{6}{18}$ or $\frac{1}{3}$.

10.3 Warm Up

For use before Activity 10.3

1. $\frac{1}{6}$ **2.** $\frac{1}{2}$ **3.** $\frac{1}{3}$

4. $\frac{1}{6}$ **5.** $\frac{1}{2}$ **6.** $\frac{1}{2}$

10.3 Start Thinking!

For use before Lesson 10.3

Sample answer: When you conduct an experiment, the relative frequency of an event is the fraction or percent of the time that the event occurs.

$$\text{relative frequency} = \frac{\text{number of times the event occurs}}{\text{total number of times you conduct the experiment}}$$

10.3 Warm Up

For use before Lesson 10.3

1. $\frac{2}{10}$, 20% **2.** 0%

3. $\frac{4}{10}$, 40% **4.** $\frac{8}{10}$, 80%

10.3 Practice A

1. $\frac{3}{10}$ **2.** $\frac{3}{5}$ **3.** $\frac{7}{10}$

4. a. $\frac{2}{5}$ **b.** $\frac{3}{5}$ **5. a.** $\frac{5}{16}$ **b.** 45

Answers

6.

Outcome	Experimental Probability
2 Heads	$\frac{1}{6}$
1 Head, 1 Tail	$\frac{7}{12}$
2 Tails	$\frac{1}{4}$

7. 1 head, 1 tail **8.** $\frac{1}{2}$

9. One tail had the highest probability in both Exercises 7 and 8.

10.3 Practice B

1. $\frac{7}{20}$ **2.** $\frac{9}{20}$ **3.** $\frac{4}{5}$ **4.** $\frac{13}{20}$

5. a. $\frac{7}{30}$ **b.** 28 **6.** 400 packages

7. a. 50 times **b.** 6 times **c.** 3 tails
d. $\frac{3}{25}$ **e.** 24 times

10.3 Enrichment and Extension

1.

Outcome	Tally	Frequency
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

2. *Sample answer:* The outcomes will not be equally likely. The smaller numbers will be more likely than the larger numbers. There is only one way to get an outcome of 12, and that is to pick a King and an Ace. There are 4 of each in the deck, but it is still much less likely than choosing two cards that are only one apart, which can happen in a lot more ways (Ace and 2, 2 and 3, 3 and 4, 4 and 5, etc). As the possible outcome gets bigger, there are less ways to get that outcome, which makes it less likely to occur.

3. *Answer should include, but is not limited to:* Make sure students perform the experiment at least 60 times and that they use the absolute value of the difference.

4. *Answer should include, but is not limited to:* Make sure bar graph is created correctly. Students should have similar results.

5. *Sample answer:* The most common outcome is 1. As the outcomes get bigger, each one is slightly less likely than the one before it. So, the least common outcome is 12. However, zero does not follow the pattern. The likelihood of getting a difference of zero is somewhere in the middle.

6. *Sample answer:* Because you are choosing from 52 different cards, there are too many possible outcomes to list and count.

7. Because there are a large number of items to choose from and a fairly larger number of possible outcomes, it is necessary to do a lot of trials in order for the results to more accurately coincide with the theoretical probability.

8. The possible outcomes would range from -12 to 12. The most common outcomes are -1 and 1. The least common outcomes are -12 and 12.

9. This game is not fair because the smaller outcomes are much more likely than the larger outcomes. *Sample answer:* The rules would be more fair if they said: Player 1 gets a point if the positive difference is 1, 4, 5, 8, 9, or 12, and Player 2 gets a point if the positive difference is 2, 3, 6, 7, 10, or 11.

10.3 Puzzle Time

HUCKLEBERRY FAN

Answers

10.4 Start Thinking!

For use before Activity 10.4

8; *Sample answer:* chocolate with sprinkles, chocolate with peanuts, chocolate with caramel, chocolate with whipped cream, vanilla with sprinkles, vanilla with peanuts, vanilla with caramel, vanilla with whipped cream

10.4 Warm Up

For use before Activity 10.4

1. 60 **2.** 126 **3.** 100

4. 1080 **5.** 1350 **6.** 504

10.4 Start Thinking!

For use before Lesson 10.4

60; *Sample answer:* Multiply 3, 4, and 5 together.

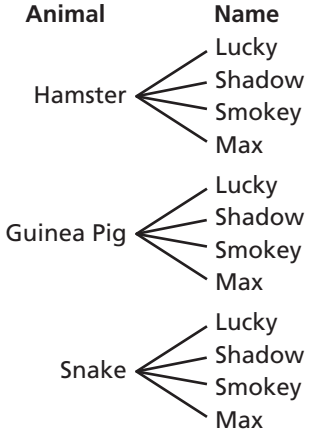
10.4 Warm Up

For use before Lesson 10.4

1. 1000

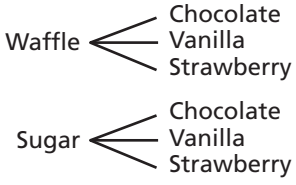
10.4 Practice A

1.



12; 12

2.



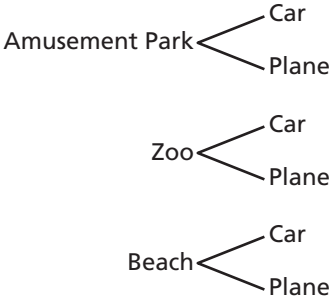
6; 6

3. 9 **4.** 16

5. 1024 **6.** 18,137,088

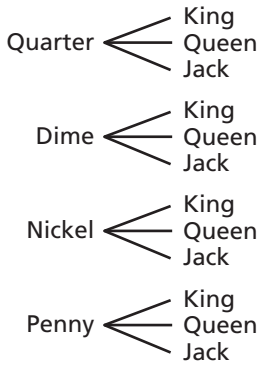
10.4 Practice B

1.



6; 6

2.



12; 12

3. 8 **4.** 18

5. a. 5040 **b.** 720

6. 6,760,000; 60,840,000

10.4 Enrichment and Extension

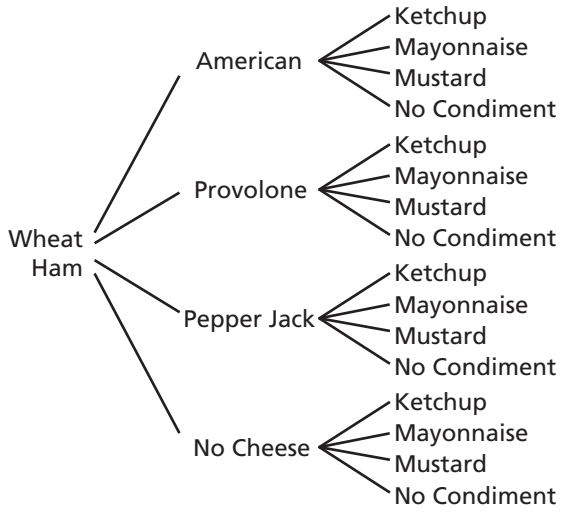
1. 256 sandwiches **2.** 64 sandwiches

3. a. There are 3 choices for sides which means the total combinations from Exercise 1 needs to be multiplied by 3.

b. 768 sandwich platters

Answers

4.



5. $\frac{1}{256}$

10.4 Puzzle Time

A TYRANT

10.5 Start Thinking!

For use before Activity 10.5

Sample answer: Independent means not relying on others; dependent means relying on others; I did my homework independently, but was dependent on my group members during our project.

10.5 Warm Up

For use before Activity 10.5

1. 5 **2.** 2 **3.** 2

4. 1 **5.** 5 **6.** 8

10.5 Start Thinking!

For use before Lesson 10.5

No, your friend is not correct. The events are dependent because the marble you did not replace affects the outcome of the second event.

10.5 Warm Up

For use before Lesson 10.5

1. Independent because the outcome of rolling the cube the first time does not affect rolling the cube the second time.

2. Independent because the outcome of flipping the coin the first time does not affect flipping the coin the second time.

3. Dependent because one of the marbles is removed from the bag and set aside so it cannot be drawn the second time.

4. Independent because the first marble is placed back in the bag and can be drawn the second time.

10.5 Practice A

1. independent; The second spin is not affected by the first spin.

2. dependent; One person cannot be both president and vice president.

3. $\frac{3}{10}$ **4.** $\frac{2}{5}$ **5.** $\frac{2}{21}$ **6.** $\frac{2}{7}$

7. $\frac{1}{15}$ **8.** $\frac{1}{36}$ **9.** $\frac{1}{4}$

10.5 Practice B

1. dependent; There are 10 pins on first throw and 4 pins on second throw.

2. independent; The second roll is not affected by the first roll.

3. $\frac{1}{5}$ **4.** $\frac{3}{10}$ **5.** $\frac{1}{21}$ **6.** $\frac{1}{21}$

7. $\frac{3}{51}$ **8.** $\frac{1}{1000}$ **9.** $\frac{1}{8}$

10.5 Enrichment and Extension

1. $\frac{1}{20}$ **2.** 3; $\frac{3}{20}$ **3.** 16; $\frac{4}{5}$

4. a. \$55, \$60, \$65 **b.** $\frac{3}{20}$

5. a. \$30, \$35, \$40 **b.** $\frac{3}{20}$

6. The probabilities are the same. The winning values change from the first spin to the second spin, but the number of winning sections does not change because you need to get a total of \$90, \$95, or \$100 to win. So the probability does not change.

7. $\frac{3}{20}$

8. a. $\frac{1}{4}$ **b.** $\frac{7}{40}$ **9. a.** $\frac{11}{20}$ **b.** $\frac{11}{50}$

10. a. $\frac{1}{10}$ **b.** $\frac{17}{200}$ **11. a.** $\frac{3}{4}$ **b.** $\frac{3}{20}$

10.5 Puzzle Time

A SHEEPDOG

Answers

Extension 10.5 Start Thinking!

For use before Extension 10.5

Sample answer: Find the probability of the event.

$$P(\text{mistakes}) = \frac{2}{50} = \frac{1}{25}$$

To make the prediction, multiply the probability of mistakes by the number of papers, $\frac{1}{25} \bullet 1000 = 40$.

You can predict that there will be 40 mistakes.

Extension 10.5 Warm Up

For use before Extension 10.5

1. $\frac{1}{10}$, 10% **2.** $\frac{4}{10}$, 40% **3.** $\frac{1}{10}$, 10% **4.** $\frac{8}{10}$, 80%

Extension 10.5 Practice

1. 13

2. 13%

3. 12%; increasing the number of trials would bring the experimental probability closer to 12%

10.6 Start Thinking!

For use before Activity 10.6

Sample answer: Events are independent if one occurrence of one event does not affect the likelihood that the other event(s) will occur. For example, you spin a 2 on a spinner and roll a 2 on a number cube. Events are dependent if the occurrence of one event does affect the likelihood that the other event(s) will occur. For example, you randomly choose a tile from a bag and without replacing the tile, you choose another tile.

10.6 Warm Up

For use before Activity 10.6

1. $\frac{1}{12}$, $8\frac{1}{3}\%$

2. $\frac{1}{4}$, 25%

3. $\frac{1}{4}$, 25%

4. $\frac{1}{3}$, $33\frac{1}{3}\%$

10.6 Start Thinking!

For use before Lesson 10.6

Sample answer: No, because the sample is too small.

10.6 Warm Up

For use before Lesson 10.6

1. population; sample

2. sample; population

3. population; sample

4. sample; population

10.6 Practice A

1. population: All students in a school;
sample: 30 students in a school

2. population: All the strawberries in the field;
sample: 75 strawberries in the field

3. **a.** all the students in your school

b. 30 random students that you meet in the hallway between classes

c. unbiased; You are surveying at different times of the day and in the hallway rather than in your classrooms

4. sample A; surveyed the county, rather than just one city

5. sample A; larger sample size

6. population; You have access to all of the members of your family.

7. sample; It would not be easy to contact or visit every grocery store in the state of Florida.

8. 840 students

10.6 Practice B

1. **a.** fans at the Miami Dolphins and Dallas Cowboys game

b. 50 fans with season tickets for the Dolphins

c. not reasonable; Dolphins fans are more likely to say that the Dolphins will win. You must also survey the Cowboys fans.

2. sample B; surveyed your town, rather than just your neighborhood

3. sample; It would not be easy to survey every student at your school.

4. population; It is possible for you to ask all of the students in your history class.

5. 12 students

6. **a.** teenagers; *Sample answer:* It is more likely that teenagers favor rap music.

b. *Sample answer:* circle graph, bar graph

c. yes; *Sample answer:* When people in their 70s were younger, there was no rap music.

10.6 Enrichment and Extension

1. No, the Electoral College votes represent the majority of the state. Even if a candidate gets just a few more votes than their opponent does, the candidate will most likely earn all of the Electoral College votes for that state.

Answers

2. California: 134 students; District of Columbia: 7 students; Florida: 66 students; Louisiana: 22 students; Montana: 7 students

3. *Sample answer:* The Electoral College votes are not proportional to the state's popular vote. So, a presidential candidate can have big wins in some states and narrowly miss in others resulting in more popular votes and less Electoral College votes than their opponent has.
Sample answer: In 2000, Al Gore won the popular vote by over 500,000 votes, but earned fewer Electoral College votes than George W. Bush. The Florida votes had to be recounted by hand in many precincts. Before the recount was complete, the U.S. Supreme Court ruled that the most recent data would stand, which gave Bush the win by less than 1000 votes. So, Bush earned all of the state's Electoral votes, which gave him the narrowest win in the Electoral College since the 1876 election.

4. *Sample answer:* Television stations work with other organizations to gather data from pre-election polls, exit polls, and early vote reporting. The pre-election polls give them an idea of who might win the state before the election. Then they collect data the day of the election to verify this prediction before making a projection. Precincts from across the state are chosen at random so that the sample of precincts will be representative of the state's population. Within the sample precincts, people take exit polls randomly (from every third or fifth person leaving the polls, for example). They ask voters about themselves and who they voted for. Some of the actual votes from these precincts are reported early as well. The results from these sample precincts are the most important predictor for making a projection for the population of the state because they tend to be more accurate than pre-election polls. In states where the polls are close, however, a projection is not made until more actual votes are reported and there is more certainty about who will win. Some states, such as California, traditionally vote for the same party one election after another. When the sample polling confirms that the vast majority of the state is in favor of one candidate, the television station can project the state with a high degree of certainty very early on. For states such as Florida, the margin of victory is often much closer and harder to determine without more official votes reported.

10.6 Puzzle Time

GO FISH

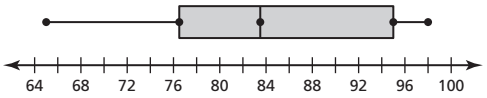
Extension 10.6 Start Thinking!

For use before Extension 10.6

Sample answer: Step 1: Order the data. Find the median and the quartiles; Step 2: Draw a number line that includes the least and greatest values. Graph points above the number line that represent the five-number summary; Step 3: Draw a box between the quartiles. Draw a line through the median. Draw whiskers from the box to the least and greatest values.

Extension 10.6 Warm Up

For use before Extension 10.6



Extension 10.6 Practice

1. a. Check students' work.

b. Check students' work.

c. Check students' work. *Sample answer:* yes; Increase the number of random samples.

2. a. Check students' work.

b. Check students' work.

c. Check students' work.

d. Check students' work.

10.7 Start Thinking!

For use before Activity 10.7

Sample answer: Given the data 2, 3, 4, 4, 6, 8, 8;
The mean of a data set is the sum of the data divided by the number values. So, the mean is

$$\frac{2 + 3 + 4 + 4 + 6 + 8 + 8}{7} = \frac{35}{7} = 5.$$

The median is found by first ordering the data and then finding the middle value. So, the median is 4.

10.7 Warm Up

For use before Activity 10.7

1. 12 **2.** 62 **3.** 37

4. 78.5 **5.** 38 **6.** 65.5

10.7 Start Thinking!

For use before Lesson 10.7

Sample answer: Compare the heights of girls in 6th and 8th grades. You can compare the measures of center, the measures of variation, the shape of the distribution, and the overlap of the two distributions.

Answers

10.7 Warm Up

For use before Lesson 10.7

1. Team 1: mean: 57; median: 56; mode: 56; range: 25; IQR: 12; MAD: 5.8

Team 2: mean: 58; median: 57; mode: 49; range: 23; IQR: 11; MAD: 5.6

2. Team 2 had a greater mean and median. Team 1 has a greater mode, range, and measures of variation.

10.7 Practice A

1. a. Varsity Team: mean: 17.5; median: 18; mode: 18; range: 3; IQR: 1; MAD: 0.75

Junior Varsity Team: mean: 16.25; median: 16.5; mode: 17; range: 4; IQR: 1.5; MAD: 0.92

b. The Varsity Team has greater measures of central tendency because the mean, median, and mode are greater. The Junior Varsity Team has greater measures of variation because the range, interquartile range, and mean absolute deviation are greater.

c. mean and MAD; Both distributions are approximately symmetric.

d. The difference in the means is about 1.36 to 1.67 times the MAD.

2. a. City A: median: 3; IQR: 4

City B: median: 6; IQR: 4

The variation in the number of inches of snow is the same, but City B had 3 more inches than City A.

b. The difference in the medians is 0.75 times the IQR.

10.7 Practice B

1. a. Football:
mean: 189, median: 178, mode: 178, range: 158, IQR: 28, MAD: 22.89

Basketball:
mean: 199, median: 194, no mode, range: 145, IQR: 47, MAD: 31.67

b. The basketball pep rallies have greater measures of central tendency because the mean and median are greater. Football has greater range, but basketball has greater interquartile range and mean absolute deviation.

c. The median and the IQR; both distributions are skewed.

d. The difference in the medians is about 0.34 to 0.57 times the IQR.

2. a. Garden A: median: 54; IQR: 18

Garden B: median: 42; IQR: 18

The variation in the height of the corn stalks is the same, but Garden A had 12 more inches than Garden B.

b. The difference in the medians is about 0.67 times the IQR.

10.7 Enrichment and Extension

1. expected value: 6; Daulton should pass because the expected value is more than 4.

2. expected value: 5.25; Ally should be confident because the expected value is greater than the value of her friend's card.

3. expected value: 6; Paxton should spin because the expected value is equal to the lowest number he can get to win.

4. $P(\text{Exercise 1}) = \frac{1}{3}$

$P(\text{Exercise 2}) = \frac{1}{2}$

$P(\text{Exercise 3}) = \frac{3}{5}$

The advice would be the same for Exercises 1 and 3, but not Exercise 2. Because the probability for Exercise 2 is equal to $\frac{1}{2}$, Ally should not be confident she will win.

5. Expected value and probability are not the same thing. *Sample answer:* Probability is better because the expected value may not be a possible outcome.

10.7 Puzzle Time

LIGHTHOUSE

Technology Connection

1. The results of the two cases should be similar. As long as the areas of the two outcomes are equal, regardless of whether the sections are adjacent or not, the results should be fairly close.

2. The spinner should be labeled with sections from 2 to 12. The weights of the sections should be the following: 2 and 12 set to 1; 3 and 11 set to 2; 4 and 10 set to 3; 5 and 9 set to 4; 6 and 8 set to 5; and 7 set to 6. The theoretical probability of rolling each number in 1000 trials is approximately the following: 2 or 12: 28 times; 3 or 11: 56 times; 4 or 10: 83 times; 5 or 9: 111 times; 6 or 8: 139 times; 7: 167 times