# Grade 4 Chapter 16
## Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher’s Guide to Using</td>
<td>iv</td>
</tr>
<tr>
<td>Chapter 16 Resources</td>
<td></td>
</tr>
<tr>
<td>Chapter 16 Graphic Organizer</td>
<td>1</td>
</tr>
<tr>
<td>Student Glossary</td>
<td>2</td>
</tr>
<tr>
<td>Family Letter</td>
<td>4</td>
</tr>
<tr>
<td>Family Letter Spanish</td>
<td>5</td>
</tr>
<tr>
<td>Chapter 16 Anticipation Guide</td>
<td>6</td>
</tr>
<tr>
<td>Chapter 16 Game</td>
<td>7</td>
</tr>
<tr>
<td>Lesson 16-1 Probability and Outcomes</td>
<td>8</td>
</tr>
<tr>
<td>Reteach</td>
<td></td>
</tr>
<tr>
<td>Skills Practice</td>
<td>9</td>
</tr>
<tr>
<td>Homework Practice</td>
<td>10</td>
</tr>
<tr>
<td>Problem-Solving Practice</td>
<td>11</td>
</tr>
<tr>
<td>Enrich</td>
<td>12</td>
</tr>
<tr>
<td>Lesson 16-2 Probability and Fractions</td>
<td>13</td>
</tr>
<tr>
<td>Reteach</td>
<td></td>
</tr>
<tr>
<td>Skills Practice</td>
<td>14</td>
</tr>
<tr>
<td>Homework Practice</td>
<td>15</td>
</tr>
<tr>
<td>Problem-Solving Practice</td>
<td>16</td>
</tr>
<tr>
<td>Enrich</td>
<td>17</td>
</tr>
<tr>
<td>Lesson 16-3 Problem-Solving Strategy: Make an Organized List</td>
<td>18</td>
</tr>
<tr>
<td>Reteach</td>
<td></td>
</tr>
<tr>
<td>Skills Practice</td>
<td>20</td>
</tr>
<tr>
<td>Homework Practice</td>
<td>21</td>
</tr>
<tr>
<td>Enrich</td>
<td>22</td>
</tr>
<tr>
<td>Lesson 16-4 Find Probability</td>
<td>23</td>
</tr>
<tr>
<td>Reteach</td>
<td></td>
</tr>
<tr>
<td>Skills Practice</td>
<td>24</td>
</tr>
<tr>
<td>Homework Practice</td>
<td>25</td>
</tr>
<tr>
<td>Problem-Solving Practice</td>
<td>26</td>
</tr>
<tr>
<td>Enrich</td>
<td>27</td>
</tr>
<tr>
<td>Lesson 16-5 Problem-Solving Investigation: Choose a Strategy</td>
<td>28</td>
</tr>
<tr>
<td>Reteach</td>
<td></td>
</tr>
<tr>
<td>Skills Practice</td>
<td>29</td>
</tr>
<tr>
<td>Homework Practice</td>
<td>30</td>
</tr>
<tr>
<td>Enrich</td>
<td>31</td>
</tr>
<tr>
<td>Lesson 16-6 Tree Diagrams</td>
<td>33</td>
</tr>
<tr>
<td>Reteach</td>
<td></td>
</tr>
<tr>
<td>Skills Practice</td>
<td>34</td>
</tr>
<tr>
<td>Homework Practice</td>
<td>35</td>
</tr>
<tr>
<td>Problem-Solving Practice</td>
<td>36</td>
</tr>
<tr>
<td>Enrich</td>
<td>37</td>
</tr>
<tr>
<td>Individual Progress Checklist</td>
<td>38</td>
</tr>
<tr>
<td>Chapter Tests:</td>
<td></td>
</tr>
<tr>
<td>Chapter Diagnostic Assessment</td>
<td>39</td>
</tr>
<tr>
<td>Chapter Pretest</td>
<td>40</td>
</tr>
<tr>
<td>Quiz 1</td>
<td>41</td>
</tr>
<tr>
<td>Quiz 2</td>
<td>42</td>
</tr>
<tr>
<td>Quiz 3</td>
<td>43</td>
</tr>
<tr>
<td>Mid-Chapter Review</td>
<td>44</td>
</tr>
<tr>
<td>Vocabulary Test</td>
<td>45</td>
</tr>
<tr>
<td>Oral Assessment</td>
<td>46</td>
</tr>
<tr>
<td>Chapter Project Rubric</td>
<td>48</td>
</tr>
<tr>
<td>Foldables Rubric</td>
<td>49</td>
</tr>
<tr>
<td>Test Form 1</td>
<td>50</td>
</tr>
<tr>
<td>Test Form 2A</td>
<td>51</td>
</tr>
<tr>
<td>Test Form 2B</td>
<td>54</td>
</tr>
<tr>
<td>Test Form 2C</td>
<td>55</td>
</tr>
<tr>
<td>Test Form 2D</td>
<td>57</td>
</tr>
<tr>
<td>Test Form 3</td>
<td>59</td>
</tr>
<tr>
<td>Extended—Response Test</td>
<td>60</td>
</tr>
<tr>
<td>End-of-Year Test</td>
<td>61</td>
</tr>
<tr>
<td>Recording Sheet</td>
<td>63</td>
</tr>
<tr>
<td>Cumulative Standardized Test Practice</td>
<td>64</td>
</tr>
<tr>
<td>Answer Pages</td>
<td>A1</td>
</tr>
</tbody>
</table>
Teacher’s Guide to Using the 
Chapter 16 Resource Masters

The Chapter 16 Resource Masters includes the core materials needed for Chapter 16. These materials include worksheets, extensions, and assessment options. The answers for these pages appear at the back of this booklet.

All of the materials found in this booklet are included for viewing and printing on the TeacherWorks Plus™ CD-ROM.

Chapter Resources

Graphic Organizer (page 1) This master is a tool designed to assist students with comprehension of grade-level concepts. You can use this graphic organizer in coordination with the appropriate lesson. While the content and layout of these tools vary, their goal is to assist students by providing a visual representation from which they can learn new concepts.

Student Glossary (page 2) This master is a study tool that presents the key vocabulary terms from the chapter. You may suggest that students highlight or star the terms they do not understand. Give this list to students before beginning Lesson 16-1. Remind them to add these pages to their mathematics study notebooks.

Anticipation Guide (page 6) This master is a survey designed for use before beginning the chapter. You can use this survey to highlight what students may or may not know about the concepts in the chapter. If feasible, interview students in small groups, asking them the interview questions in the guide. There is space for recording how well students answer the questions before they complete the chapter. You may find it helpful to interview students a second time, after completing the chapter, to determine their progress.

Game (page 7) A game is provided to reinforce chapter concepts and may be used at appropriate times throughout the chapter.

Resources for Lessons

Reteach Each lesson has an associated Reteach worksheet. In general, the Reteach worksheet focuses on the same lesson content but uses a different approach, learning style, or modality than that used in the Student Edition. The Reteach worksheet closes with computational practice of the concept.

Skills Practice The Skills Practice worksheet for each lesson focuses on the computational aspect of the lesson. The Skills Practice worksheet may be helpful in providing additional practice of the skill taught in the lesson. It also contains word problems that cover the skill. Spaces for students’ answers are provided on the worksheet.

Homework Practice The Homework Practice worksheet provides an opportunity for additional computational practice. The Homework Practice worksheet includes word problems that address the skill taught in the lesson. Spaces for students’ answers are provided on the worksheet.

Problem-Solving Practice The Problem-Solving Practice worksheet presents additional reinforcement in solving word problems that apply both the concepts of the lesson and some review concepts.

Enrich The Enrich worksheet presents activities that extend the concepts of the lesson or offer a historical or multicultural look at the lesson’s concepts. Some Enrich materials are designed to widen students’ perspectives on the mathematics they are learning.

Resources for Problem-Solving Lessons In recognition of the importance of problem-solving strategies, worksheets for problem-solving lessons follow a slightly different format. For problem-solving lessons, a two-page Reteach worksheet offers a complete model for choosing a problem-solving strategy. For each Problem-Solving Strategy lesson, Reteach and Homework
Practice worksheets offer reinforcement of the strategy taught in the Student Edition lesson. In contrast, the Problem-Solving Investigation worksheets include a model strategy on the Reteach worksheets and provide problems requiring several alternate strategies on practice worksheets.

**Assessment Options**

The assessment masters in the *Chapter16 Resource Masters* offer a wide variety of assessment tools for monitoring progress as well as final assessment.

**Individual Progress Checklist** This checklist explains the chapter’s goals or objectives. Teachers can record whether a student’s mastery of each objective is beginning (B), developing (D), or mastered (M). The checklist includes space to record notes to parents as well as other pertinent observations.

**Chapter Diagnostic Assessment** This one-page test assesses students’ grasp of skills that are needed for success in the chapter.

**Chapter Pretest** This one-page quick check of the chapter’s concepts is useful for determining pacing. Performance on the pretest can help you determine which concepts can be covered quickly and which specific concepts may need additional time.

**Quizzes** Three free-response quizzes offer quick assessment opportunities at appropriate intervals in the chapter.

**Mid-Chapter Review** This one-page chapter test provides an option to assess the first half of the chapter. It includes both multiple-choice and free-response questions.

**Vocabulary Test** This one-page test focuses on chapter vocabulary. It is suitable for all students. It includes a list of vocabulary words and questions to assess students’ knowledge of the words.

**Oral Assessment** This two-page test consists of one page for teacher directions and questions and a second page for recording responses. Although this assessment is designed to be used with all students, the interview format focuses on assessing chapter content assimilated by ELL students. The variety of approaches includes solving problems using manipulatives as well as pencil and paper.

**Chapter Project Rubric** This one-page rubric is designed for use in assessing the chapter project. You may want to distribute copies of the rubric when you assign the project and use the rubric to record each student’s chapter project score.

**Foldables Rubric** This one-page rubric is designed to assess the Foldables graphic organizer. The rubric written to the students, telling them what you will be looking for as you evaluate their completed Foldables graphic organizer.

**Leveled Chapter Tests**

- **Form 1** assesses basic chapter concepts through multiple-choice questions and is designed for use with on-level students.
- **Form 2A** is designed for on-level students and is primarily for those who may have missed the Form 1 test. It may be used as a retest for students who received additional instruction following the Form 1 test.
- **Form 2B** is designed for students with a below-level command of the English language.
- **Form 2C** is a free-response test designed for on-level students.
- **Form 2D** is written for students with a below-level command of the English language.
- **Form 3** is a free-response test written for above-level students.
- **Extended-Response Test** is an extended response test for on-level students.
- **End-of-Year Test** is a four-page test covering all the key concepts taught at this grade level.

**Student Recording Sheet** This one-page recording sheet is for the standardized test in the Student Edition.

**Cumulative Standardized Test Practice** This three-page test, aimed at on-level students, offers multiple-choice questions and free-response questions.

**Answers**

The answers for the Anticipation Guide and Lesson Resources are provided as reduced pages with answers appearing in black. Full size line-up answer keys are provided for the Assessment Masters.
What is the probability of picking a triangle out of the bag? Check the appropriate box.

<table>
<thead>
<tr>
<th>Certain</th>
<th>Likely</th>
<th>Unlikely</th>
<th>Impossible</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="triangle" alt="Diagram 1" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="square" alt="Diagram 2" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="circle" alt="Diagram 3" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="triangle" alt="Diagram 4" /></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Student-Built Glossary

This is an alphabetical list of new vocabulary terms you will learn in **Chapter 16: Probability**. As you study the chapter, complete each term’s definition or description. Remember to add the page number where you found the term. Add this page to your math study notebook to review vocabulary at the end of the chapter.

<table>
<thead>
<tr>
<th>Vocabulary Term</th>
<th>Found on Page</th>
<th>Definition/Description/Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favorable outcomes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fraction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outcome</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prediction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probability</td>
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<td></td>
</tr>
<tr>
<td>Tree diagram</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Dear Family,

Today my class started Chapter 16: Probability. I will be learning to find probability. I will also be learning to make predictions for probability situations. Here are my vocabulary words and an activity that we can do together.

Love ________________

Key Vocabulary

Probability: A number between 0 and 1 that measures the likelihood of an event happening.

Outcome: A possible result of an experiment.

Favorable outcomes: Desired results in a probability experiment.

Prediction: Something you think will happen such as a specific outcome of an experiment.

Tree diagram: A diagram of all the possible outcomes of an event or series of events or experiments.

Fraction: A number that represents part of a whole or part of a set. Example: \(\frac{1}{2}, \frac{3}{4}, \frac{5}{6}\)

Activity

Flip a coin 10 times and record whether you get heads or tails on a chart. Examine the results and decide what the chance is of you getting the same result if you repeated the exercise. Explain your decision.

Books to Read

Hannah’s Collections
by Marthe Jocelyn

17 Kings and 42 Elephants
by Margaret Mahy

Bunches and Bunches of Bunnies
by Louise Mathews
Estimada familia:

Hoy mi clase comenzó el Capítulo 16: Las probabilidades. Aprenderé a estimar probabilidades y también a hacer predicciones para situaciones de probabilidad. A continuación, están mis palabras de vocabulario y una actividad que podemos hacer juntos.

Cariños, ______________________

Vocabulario clave

probabilidad Número entre 0 y 1 que mide la posibilidad de que ocurra un evento.

resultado Resultado posible de un experimento.

resultados favorables Los resultados deseados en un experimento probabilístico.

predicción Algo que crees que sucederá, como un resultado específico de un experimento.

diagrama de árbol Diagrama de todos los resultados posibles de un evento o series de eventos o experimentos.

fracción Número que representa parte de un todo o parte de un conjunto. \( \frac{1}{2}, \frac{3}{4}, \frac{5}{6} \)

Libros recomendados:

Hannah’s Collections
de Marthe Jocelyn

17 Kings and 42 Elephants
de Margaret Mahy

Bunches and Bunches of Bunnies
de Louise Mathews
## Anticipation Guide
### Probability

#### STEP 1
**Before you begin Chapter 16**

- Read each statement.
- Decide whether you agree (A) or disagree (D) with the statement.
- Write A or D in the first column OR if you are not sure whether you agree or disagree, write NS (not sure).

<table>
<thead>
<tr>
<th>STEP 1 A, D, or NS</th>
<th>Statement</th>
<th>STEP 2 A or D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Probability is a number between 0 and 1 that measures the likelihood of an event happening.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>An outcome is a possible result of an experiment.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Desired results in a probability experiment are unfavorable outcomes.</td>
<td></td>
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<tr>
<td>4.</td>
<td>A prediction is something that will definitely happen.</td>
<td></td>
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<tr>
<td>5.</td>
<td>A tree diagram is a diagram of all the possible outcomes of an event or series of events or experiments.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>A fraction is a number that represents part of a whole or part of a set.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>$\frac{1}{2}$ is a fraction.</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>65 is a fraction.</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>5.9 is a fraction.</td>
<td></td>
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<tr>
<td>10.</td>
<td>Just because a prediction is made, it doesn’t mean it will happen.</td>
<td></td>
</tr>
</tbody>
</table>

#### STEP 2
**After you complete Chapter 16**

- Reread each statement and complete the last column by entering an A (agree) or a D (disagree).
- Did any of your opinions about the statements change from the first column?
- For those statements that you mark with a D, use a separate sheet of paper to explain why you disagree. Use examples, if possible.
Chapter 16 Game

Predictable Numbers

Ready
You will need:
3 number cubes
paper and pencils

Set
Set up a table to keep score.

GO!
1. Have player 1 make a prediction about what numbers will be face up when all three number cubes are tossed. For example: all 3s, all even numbers, or 2 even numbers and 1 odd number.

2. Toss the cubes. If the toss of the cubes matches the prediction, the player scores 5 points.

3. Repeat with player 2.

4. Take turns making predictions and tossing the cubes. You may not repeat any predictions. The first player whose score totals 20 wins the game.
The chance, or likelihood, that something will happen is called **probability**.

Look at the spinner at the right. You could spin 1, 2, 3, 4, 5, or 6. There are 6 possible outcomes.

- The probability of spinning each number is **equally likely**.
- It is **impossible** to spin an 8.
- It is **certain** that you will spin a number greater than 0.

Look at the spinner at the right.

- The probability of spinning a 7 is **unlikely**.
- The probability of spinning an 8 is **likely**.

Look at the spinner at the right. Use the words **certain**, **likely**, **equally likely**, **unlikely**, or **impossible** to describe the probability.

1. The probability of spinning 12 is _____________.

2. It is ____________ that you will land on a number greater than 2.

3. It is ____________ that you will land on a number less than 2.

4. It is ____________ that you will land on a number less than 9.

5. It is ____________ that you will land on an odd or even number.

6. It is ____________ to land on a number greater than 8.
Skills Practice

Probability and Outcomes

Describe the probability of picking a certain shape from the bag. Use certain, likely, equally likely, unlikely, or impossible.

1. □ □ □ □ □
2. □ □ □ □ □
3. △ or ◊ □ □
4. △ ◊ or □ □

Describe the probability of each outcome. Use certain, likely, equally likely, unlikely, or impossible.

5. spinning 2
6. spinning 3
7. spinning 6
8. spinning 1
9. spinning 3 or 4
10. spinning 1, 2, 3, or 4

Describe the probability of each outcome. Use certain, likely, equally likely, unlikely, or impossible.

11. The month after September will be November.
12. It will be sunny or rainy tomorrow.
13. It will snow in Alaska this year.

Solve.

14. A bag contains 3 red and 7 white balls. Is it unlikely, likely, or equally likely you will pick a red ball?

15. A box contains 6 red pencils and 6 black pencils. Is it unlikely, likely, or equally likely you will pick a red pencil?
Describe the probability of each outcome. Use certain, likely, equally likely, unlikely, or impossible.

1. Spinning an even number _________________
2. Spinning a 2 _________________
3. Spinning a 4, 5, or 6 _________________
4. Spinning a 7 _________________
5. Spinning a 1, 2, 3, 4, 5, or 6 _________________

Create a table to show the possible outcomes for the situation. Then, use the table to describe the probability of the outcome.

6. Jorge is picking something for dinner. He has 2 boxes of pasta, 3 boxes of rice, and 7 types of meat. If he picks one randomly, describe the probability of picking a meat.

Spiral Review

Subtract. (Lesson 15–6)

7. 13.87
   \[ \begin{array}{c}
   \hline
   13.87 \\
   - 6.42 \\
   \hline
   \end{array} \]
8. 21.66
   \[ \begin{array}{c}
   \hline
   21.66 \\
   - 13.56 \\
   \hline
   \end{array} \]
9. 18.04
   \[ \begin{array}{c}
   \hline
   18.04 \\
   - 9.75 \\
   \hline
   \end{array} \]
10. $8.99
    \[ \begin{array}{c}
    \hline
    8.99 \\
    - 3.15 \\
    \hline
    \end{array} \]
11. $16.05
    \[ \begin{array}{c}
    \hline
    16.05 \\
    - 7.33 \\
    \hline
    \end{array} \]
12. $12.50
    \[ \begin{array}{c}
    \hline
    12.50 \\
    - 9.95 \\
    \hline
    \end{array} \]
Problem-Solving Practice

Probability and Outcomes

Describe the probability of each outcome. Use certain, likely, equally likely, unlikely, or impossible.

1. spinning a star or a sun
2. spinning a butterfly

3. spinning a baseball or bat
4. spinning a catcher’s mitt

5. spinning a hot dog or a hamburger
6. probability of spinning a soda
Use this number line to plot probabilities. Write the number of each outcome described above the place where you think it belongs.

1. The weatherman predicts a 75% chance of snow.

2. Your uncle buys one lottery ticket and wins $1,000,000.

3. Tuesday will follow Monday next week.

4. Lewis flips a coin and gets tails.

5. Deborah, who is holding three quarters, two dimes, and one nickel, accidentally drops one of the dimes.
Reteach
Probability and Fractions

You can use a fraction to show probability.

\[ \text{Probability} = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}} \]

You can use probability to predict an outcome. If you pick one of these counters without looking, there are 5 possible outcomes.

The probability of picking a \( \bigcirc \) is \( \frac{2}{5} \).
The probability of picking a \( \bigcirc \) is \( \frac{1}{5} \).
The probability of picking a \( \bigcirc \) is \( \frac{2}{5} \).

Use a fraction to describe the probability of each outcome.

1. \( \square \) ______ 3. \( \bigcirc \) ______
2. \( \triangle \) ______ 4. \( \star \) ______

Use a fraction to describe the probability of each outcome.

5. A ______ 7. C ______

Use a fraction to describe the probability of each outcome.

9. a pencil ______
10. a pen ______
11. an eraser ______ 13. a pad of paper ______
12. a pair of scissors ______ 14. a crayon ______
Skills Practice
Probability and Fractions

Use a fraction to describe the probability of each outcome.

1. \(\frac{3}{4}\)  
2. \(\frac{1}{4}\)  
3. \(\frac{4}{4}\)  
4. \(\frac{2}{4}\)  
5. \(\frac{3}{4}\) or \(\frac{4}{4}\)  
6. \(\frac{5}{4}\)

Use a fraction to describe the probability of each outcome.

7. circle  
8. triangle  
9. square  
10. pentagon  
11. hexagon  
12. triangle or square

Use a fraction to describe the probability of each outcome.

13. blue  
14. red  
15. green  
16. purple  
17. red or blue  
18. blue or green

Solve.

19. Greg has a coin in one of his closed hands. What is the probability that Greg’s friend will pick the hand the coin is in?

20. Karen turns over 5 paper cups. She hides a coin under one of them. What is the probability that Steven will guess which cup the coin is under?
A shape is picked from the bag. Use a fraction and words to describe the probability of each outcome.

1. Picking a square ________________________________
2. Picking a circle ________________________________
3. Picking a rectangle ______________________________
4. Picking a triangle ________________________________
5. Picking a square or triangle ________________________________

Spiral Review

Describe the probability of each outcome. Use certain, likely, equally likely, unlikely, or impossible. (Lesson 16-1)

6. If Patricia picks out 1 fruit without looking, what is the probability that she will pick an apple? ____________
7. If Jane picks out a fruit without looking, what is the probability that she will pick a banana? ____________
8. If Mike picks out a fruit without looking, what is the probability that he will pick an orange? ____________
Use the spinner to solve.

1. Rita and Jose are playing a game. They decide that the first person to land on the star will go first. What is the probability of landing on the star? Express the probability as a fraction.

2. Rita and Jose take turns using the spinner. The first person to land on all four shapes wins the game. Rita goes first. What is the probability that she will land on a circle? Express the probability as a fraction.

3. Jessica and Bianca are playing a game. Each player has to name the shape she thinks she will land on before spinning. Bianca thinks she will land on a triangle. What is the probability that she will land on the triangle? Express it as a fraction.

4. Jessica thinks she will land on a square. What is the probability that she will land on a square? Express it as a fraction.

5. Simon and Luis are playing a game using the spinner. If the object of the game is to land on each shape before the other player, what shape would be the most difficult to land on? Express the probability of landing on that shape as a fraction.

6. Simon goes first. What shape is he most likely to land on? Express the probability as a fraction.
Keith is a midfielder on the Eagles soccer team. Their next game is against the Falcons. Keith thinks the Eagles will win. Then again he thinks the Eagles might lose. According to Keith, the probability of the Eagles winning is $\frac{1}{2}$.

What is wrong with Keith’s thinking?
Otto plays a game. He spins the two spinners shown below and finds the product of the numbers he lands on. What products can Otto make?

**Make an Organized List**

**Step 1 Understand**

Be sure you understand the problem.
Read carefully.
What facts do you know?
- Spinner A is marked ________ and Spinner B is marked ________

What do you need to find?
- What ________ Otto can make.

**Step 2 Plan**

Make a plan. Choose a strategy.
You can make an organized list to solve the problem.

**Remember:** A product is the answer to a multiplication problem.
### Step 3 Solve

**Carry out your plan.**

Make a list of all the possible spinner products.  
Then find each product.

<table>
<thead>
<tr>
<th>Spinner A</th>
<th>Spinner B</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>×</td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>×</td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>×</td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>×</td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>×</td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>×</td>
<td>=</td>
<td></td>
</tr>
</tbody>
</table>

What products can Otto make? ____________________________

### Step 4 Check

**Is the solution reasonable?**  
Reread the problem. Have you answered the question? _____

How can you check your answer? ____________________________  
_________________________________________________________________  
_________________________________________________________________  
_________________________________________________________________

### Practice

1. A spinner has 3 equal sections that are white, yellow, and green.  
Another spinner has 3 equal sections that are blue, purple, and red. How many different combinations of colors are possible if you spin each spinner once? ____________________________
Skills Practice

Problem-Solving Strategy

Solve. Use the make an organized list strategy.

1. Juanita had 12 pencils in a box. She needed 144 for a school wide test. How many boxes will she need?

2. Jared runs 4 laps around the track 3 times a week. How many laps does he run in 1 month? 6 weeks?

3. Alicia bought 2 sweaters for the price of one pair of jeans. The jeans cost twice the amount of the sweaters. She gave the cashier 4 twenty-dollar bills, and she received $4 back in change. How much did the sweaters cost? How much were the jeans?

4. Ally has a choice of 3 different pairs of socks including red, white, or black. If she reaches into her drawer and randomly chooses a pair, what is the probability that she will choose white?

5. Drake wants to buy a CD for his mother’s birthday. It costs $18.99. He makes $4.50 for mowing the lawn, and $5.49 for cleaning. How many times must he do each chore to make enough money for the CD?

6. Juan could make banana bread, apple bread, or muffins. He could use whole wheat flour or white flour. How many possible combinations can he make?
Solve. Use the make an organized list strategy.

1. Koko has red shorts and blue shorts, and a print shirt, a T-shirt, or a tank top to wear. How many different outfits can he choose from?

2. Parker is handing out snacks. He has a large bag that is filled with smaller snack-sized bags. There is one bag of each of the following: peanuts, almonds, walnuts, mixed nuts, macadamia nuts, and cashews. What is the probability of picking a bag of macadamia nuts or almonds? How about cashews, almonds, or peanuts?

3. Martin’s older brother wanted to buy a leather bomber jacket. It cost $190. He makes $38 each weekend mowing lawns and weeding gardens for neighbors. How many weekends will he need to work in order to buy the jacket?

4. Your teacher has 3 different stickers she can choose from including smiley faces, animals, or hearts. What is the probability of her choosing a heart if she picks one without looking?

Spiral Review

One shape is picked. Use words and a fraction to describe the probability of each outcome. Use certain, likely, equally likely, unlikely, or impossible.

(Lesson 16-2)

5. Picking a triangle?
The principal keeps a dish of mints on her desk. She offered a piece to Sebastian when he turned in $3 he found on the playground. Half of the mints in the bowl had red wrappers. Without looking he grabbed a piece with a yellow wrapper. His chances of doing that again were 3 out of 23.

Use the information above to write a reasonable description of the principal’s bowl of mints.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Reteach
Find Probability

Suppose you are playing a game with a spinner. Each player spins the spinner twice. The spinner has four colors: yellow, blue, pink, and green. You can make a grid to show all of the possible outcomes of spinning the spinner. Each outcome is shown where each row and column intersect.

<table>
<thead>
<tr>
<th>First Spin</th>
<th>Second Spin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yellow (Y)</td>
</tr>
<tr>
<td>Yellow (Y)</td>
<td>YY</td>
</tr>
<tr>
<td>Blue (B)</td>
<td>BY</td>
</tr>
<tr>
<td>Pink (P)</td>
<td>PY</td>
</tr>
<tr>
<td>Green (G)</td>
<td>GY</td>
</tr>
</tbody>
</table>

Use the grid to answer each question.

1. How many possible outcomes are there? __________

2. What is the probability of spinning the same color on both spins?
   ______________________________________________________________________

3. What is the probability of spinning yellow on the first spin?
   ______________________________________________________________________

4. What is the probability of spinning red on the second spin?
   ______________________________________________________________________
Skills Practice

Find Probability

Pablo is playing a game that involves taking two turns picking a colored disc from a bag without looking. There are a total of three discs: blue, white, and yellow. The grid shows the possible outcome of the two picks.

<table>
<thead>
<tr>
<th>First Pick</th>
<th>Blue (B)</th>
<th>White (W)</th>
<th>Yellow (Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue (B)</td>
<td>BB</td>
<td>BW</td>
<td>BY</td>
</tr>
<tr>
<td>White (W)</td>
<td>WB</td>
<td>WW</td>
<td>WY</td>
</tr>
<tr>
<td>Yellow (Y)</td>
<td>YB</td>
<td>YW</td>
<td>YY</td>
</tr>
</tbody>
</table>

Use the grid to answer each question.

1. How many possible outcomes are there? ____

2. What is the probability of picking 2 white discs? ______________

3. What is the probability of picking two discs of the same color? ______________

4. Julia is competing in the finals of an archery competition. She is allowed two more turns to hit the middle of the target. Create a grid to show all of the possible outcomes for her two tries. Use the grid to find the probability of Julia hitting the target twice.

<table>
<thead>
<tr>
<th>First Try</th>
<th>Miss</th>
<th>Hit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second Try</td>
<td>Miss, Miss</td>
<td>Miss, Hit</td>
</tr>
<tr>
<td></td>
<td>Hit, Miss</td>
<td>Hit, Hit</td>
</tr>
</tbody>
</table>
The grid shows the outcomes of two spinners. Use the grid to answer each question.

<table>
<thead>
<tr>
<th>First Spinner Outcomes</th>
<th>Second Spinner Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1,1 1,2 1,3 1,4</td>
</tr>
<tr>
<td>2</td>
<td>2,1 2,2 2,3 2,4</td>
</tr>
<tr>
<td>3</td>
<td>3,1 3,2 3,3 3,4</td>
</tr>
<tr>
<td>4</td>
<td>4,1 4,2 4,3 4,4</td>
</tr>
</tbody>
</table>

1. How many possible outcomes are there? ____
2. How many outcomes contain a pair of the same number? ____
3. What is the probability of spinning two numbers that total 4? ____
4. What is the probability of spinning two numbers that have a product of 6? ____
5. What is the probability of an outcome that contains the number 1? ____
6. What is the probability of spinning two numbers that are both greater than 2? ____

7. Picking a pentagon? ___
Problem-Solving Practice
Find Probability

Use the spinner to solve.

1. Mr. Avery has a nature game in his classroom. The game has a spinner with a fish, a frog, and 2 turtles. Paco uses the spinner to make predictions. If Paco spins the spinner 100 times, what is a reasonable prediction of the number of times that he will land on a fish?

2. If Paco spins the spinner 50 times, what is a reasonable prediction of the number of times that he will land on a turtle?

3. Jerome uses the nature spinner to make predictions. If Jerome spins the spinner 100 times, what is a reasonable prediction of the number of times that he will land on a turtle?

4. If Melanie spins the spinner 50 times, what is a reasonable prediction that it will land on a frog or a fish?

5. Maggie is conducting an experiment with the nature spinner. If Maggie spins the spinner 100 times, what is a reasonable prediction of the number of times that she will land on a turtle or a frog?

6. Maggie will spin the spinner 50 times. She predicts that the spinner will land on the frog about 12 times. Is her prediction reasonable? Explain your thinking.
Complete this probability chart. Make up your own problem for number 10, and trade with a partner to check your answers.

<table>
<thead>
<tr>
<th>Random Event</th>
<th>Desired Outcome</th>
<th>Desired Outcome Possibilities</th>
<th>Total Outcome Possibilities</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pick a letter from the alphabet</td>
<td>Vowel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Pick a card from a full deck</td>
<td>Heart</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Pick a card from a full deck</td>
<td>Eight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Toss a six-sided number cube (0-5)</td>
<td>Number less than 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Toss a six-sided number cube (0-5)</td>
<td>Odd number</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Flip two coins</td>
<td>Both heads</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Flip three coins</td>
<td>All heads</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Pick a day of the week</td>
<td>The day contains the letter “r”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Pick a month of the year</td>
<td>The month has one syllable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Joel went to a pumpkin patch. He saw 10 pumpkins in each row. There were 8 rows on one side of the road, and 9 rows on the other. How many pumpkins were there?

Step 1
Understand
Be sure you understand the problem.
What facts do you know?
• Joel went to a pumpkin patch.
• There were ____ pumpkins in each row.
• There were ____ rows on one side of the road.
• There were ____ rows on the other side of the road.

Step 2
Plan
Make a plan.
Choose a strategy.
You may draw a picture. Draw the road, rows, and pumpkins.
You can also make a model.

Step 3
Solve
Carry out your plan.
Plan 1 Draw a picture. Draw the 10 pumpkins in each of the 8 rows on one side of the road and 9 rows on the other side. Add them up.
\[10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 = 80\]
\[10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 = 90\]
\[80 + 90 = 170 \text{ pumpkins}\]

Plan 2 Use counters to represent rows.
Decide what facts you know. Plan what you will do and in what order. Use your plan to solve the problem. Then check your solution to make sure it makes sense.
Step 4
Check
Is the solution reasonable?
Reread the problem.
How can you check your answer?

Solve using any strategy shown below.
• Use logical reasoning
• Work backward
• Make a model
• Make an organized list
• Draw a picture

1. Jen has 12 juice boxes in a case. She needs 96 boxes for a school picnic. How many cases will she need to bring?

2. Marsha rides her horse 3 times a week for 2 hours at a time. How many hours does she ride her horse in 2 weeks? 3 weeks?

3. Nicholas bought 4 hamburgers and 2 salads. He gave the cashier 2 ten-dollar bills. If he received $1.98 back, how much did he pay for the food?

4. Collin packed sandwiches for a field trip lunch. He had 12 turkey, 10 peanut butter, and 15 ham. Nine of the children brought their own sandwiches, so how many total children went on the field trip?

5. For your birthday, your parents bought you a bicycle for $89.49 and a new coat for $155.25. If they still have $69.98 left, how much money did they start out with?

6. Juanita made a science fair display with a spider web that spanned a 6-foot by 4-foot area. If she placed 10 spiders in each square foot, how many spiders were there?

7. Olivia weighs three times as much as her younger brother, Ricardo, and is seventeen years older. Ricardo is 4-years-old and weighs 2 times the amount of his sister’s age. How old is Olivia? How much does each sibling weigh? The weight is in pounds.
Solve using any strategy shown below.

- Use logical reasoning
- Make a model
- Draw a picture
- Work backward
- Make an organized list

1. Roberto has 90 vitamins in a bottle. If he takes the vitamins twice a day, how many days will the bottle last? ______________

2. Luis rides a motor scooter to work and home every day. He has to go 40 miles one way. How many miles will he put on the motor scooter in 7 days? 10 days?

3. Martin can choose from white socks, black socks, or colored socks, with leather shoes or tennis shoes. How many combinations of shoes and socks can he wear? ______________

4. Your parents bought you a new video game system for $199.99 and $89.99 worth of games. If they still have $40.02 left, how much money did they start out with? ______________

5. Rafael wants to plant 8 bushes in his yard. Each bush needs a 2 square foot area. How many square feet does he need in the yard for the bushes? ______________

6. Kristen sold 60 rolls of wrapping paper. She sold 12 rolls of striped paper and 18 rolls of green paper. How many rolls were red? ______________
Homework Practice
Problem-Solving Investigation

Solve using any strategy shown below.

- Use logical reasoning
- Make a model
- Draw a picture
- Work backward
- Make an organized list

1. Sydney is a receptionist and needs to make 28 phone calls. If she can make 4 phone calls in an hour, will she be able to make all of her calls in an 8 hour day? If so, how many additional phone calls will she be able to make? _______________

2. Wanda rides her bike to and from school 5 days a week. She rides \( \frac{3}{4} \) mile one way. How many miles will she bike in 1 week? 2 weeks?

3. Nora made 4 photo albums the first year, 4 photo albums the second year, 3 photo albums the third year, and 3 photo albums the fourth year. If the pattern continues, how many photo albums will she make the fifth and sixth years? _______________

4. Lola can choose from a blue sweatshirt, brown sweatshirt, or green sweatshirt, with brown boots, black boots, or tennis shoes. How many combinations can she wear? _______________

Spiral Review

The grid shows the possible outcomes of tossing a coin and spinning a spinner. Use the grid to answer the questions. (Lesson 16–4)

<table>
<thead>
<tr>
<th>Coin Flips</th>
<th>Spinner Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Red</td>
</tr>
<tr>
<td>Heads</td>
<td>H, Red</td>
</tr>
<tr>
<td>Tails</td>
<td>T, Red</td>
</tr>
</tbody>
</table>

5. How many possible outcomes are there? _____

6. What is the probability that you will flip a heads and spin a red or blue? _____

7. What is the probability that you will spin a red and flip a tails? _____
Play this game with a partner.

- Player A chooses a secret 4-digit number and writes it on a separate sheet of paper.
- Player B guesses a 4-digit number and writes it in the first row of the guess chart.
- Player A looks at the guess and then fills in the second chart. Player A tells the number of digits that are correct, AND how many are in the correct position. (For example, the secret number is 1093. The first guess is 6198. The number of correct digits is 2. The number of digits in the correct position is 1.)
- Based on that information, Player B makes a second guess.
- Continue playing until the secret number is guessed, or until 10 guesses have been used.
- Players then switch roles.
- After playing a couple of games compare the strategies you used for guessing with your partner.

<table>
<thead>
<tr>
<th>Guess</th>
<th>Number of Correct Numbers</th>
<th>Numbers of Digits in the Correct Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Reteach

Tree Diagrams

John is playing with a number cube and a penny. What are all the possible combinations of one roll of the cube and one flip of the penny?

Use a tree diagram to find all possible outcomes.

List each number on the cube 1 though 6 as well as the heads and tails of the penny.

There are 12 possible outcomes.

**Draw a tree diagram to show all possible outcomes. Then find the probability of the situation.**

1. What is the probability of choosing a red shirt and blue shorts?

<table>
<thead>
<tr>
<th>Shirt</th>
<th>Shorts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Blue</td>
</tr>
<tr>
<td>Orange</td>
<td>White</td>
</tr>
<tr>
<td></td>
<td>Black</td>
</tr>
</tbody>
</table>
Skills Practice
Tree Diagrams

Use a tree diagram to solve.

1. You spin a spinner with 4 equal sections marked 1–4. Then you spin another spinner with 3 equal sections colored red, blue, and yellow. What are all of the possible outcomes?

   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________

2. Karen throws a dart at a target with 5 equal sections marked 1–5. She then throws a dart at a target with two equal sections colored green and blue. What are all of the possible outcomes?

   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________

3. The Boardwalk Shop sells souvenir shirts. The shirts come with long sleeves or short sleeves. The shirts come in white, gray, and blue. What are all of the different kinds of shirts?

   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________

4. Boardwalk Burgers sells burgers made from beef, turkey, chicken, or soy. Burgers can have no cheese, Swiss cheese, or American cheese. How many different choices are there?

   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________
Tree Diagrams

1. What is the probability of choosing a white jacket and black shoes?

<table>
<thead>
<tr>
<th>Jacket</th>
<th>Shoes</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>Black</td>
</tr>
<tr>
<td>Black</td>
<td>Tan</td>
</tr>
<tr>
<td>Green</td>
<td>White</td>
</tr>
</tbody>
</table>

2. What location had the greatest number of people at the sandcastle-building contest?

3. What location had the least number of people?

4. What was the difference in the number of people at the two California locations?
Problem-Solving Practice

Tree Diagrams

Make a tree diagram to solve.

1. Jared and Dimitri are playing a game with 2 spinners. How many possible combinations are there if Dimitri spins both spinners?
   ____ possible combinations

2. Anna is deciding what she could wear to the zoo tomorrow. She can choose a white shirt, a green shirt, or a blue shirt. She can choose blue pants or green pants. How many different outfits can she make? ____ possible outfits
   What are they?
Tree diagrams are useful for thinking about all possible outcomes. Use the letters R for red, W for white, and B for blue to complete this tree diagram. Record all the possible outcomes for three spins of the spinner.

1st Spin

2nd Spin

3rd Spin

1st Spin

2nd Spin

3rd Spin

B

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### Individual Progress Checklist

<table>
<thead>
<tr>
<th>B</th>
<th>D</th>
<th>M</th>
<th>Goal</th>
<th>Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>find and explore probability</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>express outcomes verbally and numerically in an organized way</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>make predictions for probability situations</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>solve problems by making an organized list</td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

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Write a fraction that represents the shaded area.

1. 

2. 

3. 

4. 

5. 

Make a tally chart for each situation.

6. Christopher rolled 5 number cubes. Two cubes have the number 3 shown, one cube has the number 1 shown, one cube has a 4 shown, and one cube has a 5 shown.

7. Jess took a survey to find out her friends’ favorite foods. Their responses were: fish, chicken, pizza, chicken, pizza, pizza, pasta, pizza, pasta, and pizza.

<table>
<thead>
<tr>
<th>Number</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Food</th>
<th>Tally</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicken</td>
<td></td>
</tr>
<tr>
<td>Fish</td>
<td></td>
</tr>
<tr>
<td>Pasta</td>
<td></td>
</tr>
<tr>
<td>Pizza</td>
<td></td>
</tr>
</tbody>
</table>
Describe the probability of each outcome. Use certain, likely, equally likely, unlikely, or impossible.

1. Landing on an even number
2. Landing on a number less than 8
3. Landing on an odd number
4. Landing on a 4 or a 10

Use the grid to answer each question.

<table>
<thead>
<tr>
<th>First Spinner Outcomes (↓)</th>
<th>Pink (P)</th>
<th>Cobalt (C)</th>
<th>Orange (O)</th>
<th>Lime (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pink (P)</td>
<td>PP</td>
<td>PC</td>
<td>PO</td>
<td>PL</td>
</tr>
<tr>
<td>Cobalt (C)</td>
<td>CP</td>
<td>CC</td>
<td>CO</td>
<td>CL</td>
</tr>
<tr>
<td>Orange (O)</td>
<td>OP</td>
<td>OC</td>
<td>OO</td>
<td>OL</td>
</tr>
<tr>
<td>Lime (L)</td>
<td>LP</td>
<td>LC</td>
<td>LO</td>
<td>LL</td>
</tr>
</tbody>
</table>

5. How many possible outcomes are there?
6. What is the probability of spinning the same color twice in a row?

Use the tree diagram to answer each question. Carlos is flipping a coin and chooses a marble from the bag.

7. How many possible outcomes are there?
8. What is the probability of a coin landing on heads and choosing a blue marble?
Describe the probability of each outcome. Use certain, likely, equally likely, unlikely, or impossible.

1. Spinning an 8?

2. Spinning an even number?

3. Spinning a 1, 3, or 5?

4. Spinning an even or odd number?

5. Spinning a 10?

You pick one crayon out of the box. Use a fraction and words to describe the probability of each outcome.

6. Picking a blue crayon

7. Picking a green crayon

8. Picking a green or blue crayon

9. Picking an orange crayon

10. Picking a red or blue crayon
Quiz 2  *(Lessons 16–3 through 16–4)*

Solve using the *make an organized list* strategy.

1. Ian is hanging 4 pictures. How many ways can he organize them in a row?

2. Marsha has 4 ponytail holders to pick from and three ribbons. How many combinations can she make with 1 holder and 1 ribbon?

3. Jan has 3 names on pieces of paper in a hat. She is drawing the three names randomly. In how many different ways can she pick them?

Make a grid to show the outcomes of flipping a coin and spinning the spinner.

<table>
<thead>
<tr>
<th>Coin Flip</th>
<th>Spinner Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heads</td>
<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>Tails</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

4. How many possible outcomes are there?

5. How many outcomes contain a number greater than 2?

6. How many outcomes include a heads and a tails?

7. What is the probability that you will flip a heads and spin a 5 or 6?

8. What is the probability that you will flip a tails and spin a number greater than 3?

9. What is the probability that you will flip a heads and spin a 1?

10. What is the probability that you will flip a heads and an even number?
For exercises 1–3, draw a tree diagram to show the probability of each outcome.

1. white, 3  
2. blue, even number  
3. green, number greater than zero

Solve using any strategy shown below.

- Use the four-step plan
- Use logical reasoning
- Make a model
- Draw a picture
- Work backward
- Make an organized list

4. The school gym needs $1,900 for renovations. The school raised $450 in June and $495 in July. The school received an additional donation for $800. How much does the school still need to raise?

4. ________

5. Logan, Jack, and Max are all swimmers on a relay team. The fastest boy will swim last. The slowest boy will swim second. Logan swims faster than Max. Jack swims slower than Logan and Max. In what order will they swim?

5. ________

6. Christina makes $8.50 an hour. How many hours does she need to work in order to make $297.50?

6. ________

7. Jin rode the bus every day for a round-trip of 10 miles. How much did he travel in 1 week? In 2 weeks?

7. ________

8. Spencer made a pizza and cut it into eighths. If he ate half of it and his brother had two pieces, how many pieces were left? Write as a fraction.

8. ________
Describe the probability of each outcome. Use *certain, likely, equally likely, unlikely, or impossible.*

1. Spinning a 5
2. Spinning an even number
3. Spinning a 5, 6, or 7
4. Spinning a number between 5 and 8 (including 5 and 8)

You spin the spinner one time. Use words and a fraction to describe the probability of each outcome.

5. Spinning a spotted space
6. Spinning black or gray?
7. Spinning white, gray, or a stripe?

Solve using the make an organized list strategy.

8. Jacob has potatoes, carrots, and lettuce harvested from his garden. If he picks one without looking, what is the probability that he will choose carrots or potatoes?
9. Maria made stained glass shapes to hang in her windows. She has an apple, a heart, a diamond, and a cat. How many different ways can she arrange them in her 4 windows?
10. Samuel has a box of 4 crayons including blue, red, yellow, and green. If he picks two without looking, what are the possible colors he will pick?
Vocabulary Test

Match each word to its definition. Write your answers on the lines provided.

1. probability
   ______
   A. something you think will happen such as a specific outcome of an experiment

2. outcome
   ______
   B. a diagram of all the possible outcomes of an event or series of events or experiments

3. favorable outcomes
   ______
   C. a number that represents part of a whole or part of a set

4. prediction
   ______
   D. a number between 0 and 1 that measures the likelihood of an event happening

5. tree diagram
   ______
   E. a possible result of an experiment

6. fraction
   ______
   F. desired results in a probability experiment
Oral Assessment

Place 8 nickels, 4 dimes, 2 quarters and 1 penny on a table. Tell the student the total amount of each coin, and then place the coins in a bag.

Read each question aloud to the student. Then write the student’s answers on the lines below the question.

1. What is the probability of your picking a dime out of the bag?

2. What is the probability of your picking a nickel out of the bag?

3. Tell how you got your answer.

4. What is the probability of your picking a penny out of the bag?

5. What is the probability of your picking a quarter out of the bag?

6. Explain your answer.
7. What is the probability of spinning a 4?

8. What is the probability of spinning a 3?

9. Tell how you got your answer.

10. What is the probability of spinning a 2?

11. Explain your answer.

12. What is the probability of spinning a 5?

13. Tell how you got your answer.
### Chapter Project Rubric

<table>
<thead>
<tr>
<th>Score</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Student successfully completed the chapter project. Student demonstrated appropriate use of chapter information in completing the chapter project.</td>
</tr>
<tr>
<td>2</td>
<td>Student completed the chapter project with partial success. Student partially demonstrated appropriate use of chapter information in completing the chapter project.</td>
</tr>
<tr>
<td>1</td>
<td>Student did not complete the chapter project or completed it with little success. Student demonstrated very little appropriate use of chapter information in completing the chapter project.</td>
</tr>
<tr>
<td>0</td>
<td>Student did not complete the chapter project. Student demonstrated inappropriate use of chapter information in completing the chapter project.</td>
</tr>
</tbody>
</table>
### Probability

**Top Pocket Foldables**

<table>
<thead>
<tr>
<th>Score</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Student properly assembled Foldables graphic organizer according to instructions. Student recorded information related to the chapter in the manner directed by the Foldables graphic organizer. Student used the Foldables graphic organizer as a study guide and organizational tool.</td>
</tr>
<tr>
<td>2</td>
<td>Student exhibited partial understanding of proper Foldables graphic organizer assembly. Student recorded most but not all information related to the chapter in the manner directed by the Foldables graphic organizer. Student demonstrated partial use of the Foldables graphic organizer as a study guide and organizational tool.</td>
</tr>
<tr>
<td>1</td>
<td>Student showed little understanding of proper Foldables graphic organizer assembly. Student recorded only some information related to the chapter in the manner directed by the Foldables graphic organizer. Student demonstrated little use of the Foldables graphic organizer as a study guide and organizational tool.</td>
</tr>
<tr>
<td>0</td>
<td>Student did not assemble Foldables graphic organizer according to instructions. Student recorded little or no information related to the chapter in the manner directed by the Foldables graphic organizer. Student did not use the Foldables graphic organizer as a study guide and organizational tool.</td>
</tr>
</tbody>
</table>
Read each question carefully. Write your answer on the line provided.

Ramón has 2 pairs of black socks, 6 pairs of white socks, 2 pairs of tan socks, and 1 pair of blue socks.

**Describe the probability of each outcome.**

1. picking blue socks without looking  
   A. certain  
   B. likely  
   C. unlikely  
   D. impossible  
   1. ____

2. picking white socks without looking  
   F. certain  
   G. likely  
   H. unlikely  
   J. impossible  
   2. ____

3. picking red socks without looking  
   A. certain  
   B. likely  
   C. unlikely  
   D. impossible  
   3. ____

4. picking socks that are not green without looking  
   F. certain  
   G. likely  
   H. unlikely  
   J. impossible  
   4. ____

Roll a six-sided number cube with the numbers 1, 2, 3, 4, 5, and 6 on the faces.

**Use a fraction to describe the probability of each outcome.**

5. rolling a 2  
   A. \( \frac{1}{2} \)  
   B. \( \frac{1}{3} \)  
   C. \( \frac{1}{4} \)  
   D. \( \frac{1}{6} \)  
   5. ____

6. rolling an even number  
   F. \( \frac{1}{2} \)  
   G. \( \frac{1}{3} \)  
   H. \( \frac{1}{4} \)  
   J. \( \frac{1}{6} \)  
   6. ____

7. rolling a number more than 1  
   A. \( \frac{5}{6} \)  
   B. \( \frac{1}{3} \)  
   C. \( \frac{1}{4} \)  
   D. \( \frac{1}{6} \)  
   7. ____

8. rolling a number less than 6  
   F. \( \frac{1}{2} \)  
   G. \( \frac{1}{3} \)  
   H. \( \frac{2}{3} \)  
   J. \( \frac{5}{6} \)  
   8. ____

The grid shows the outcomes of 2 spinners.

<table>
<thead>
<tr>
<th>First Spinner Outcomes</th>
<th>Second Spinner Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>2,0</td>
</tr>
<tr>
<td>3</td>
<td>3,0</td>
</tr>
<tr>
<td>4</td>
<td>4,0</td>
</tr>
<tr>
<td>5</td>
<td>5,0</td>
</tr>
</tbody>
</table>
9. How many possible outcomes are there?
   A. 24  B. 16  C. 14  D. 8

10. What is the probability of spinning 2 numbers that are the same?
    F. \(\frac{1}{4}\)  G. \(\frac{1}{8}\)  H. \(\frac{1}{12}\)  J. \(\frac{1}{16}\)

11. What is the probability of spinning 2 numbers whose sum is less than 5?
    A. \(\frac{5}{8}\)  B. \(\frac{7}{16}\)  C. \(\frac{3}{8}\)  D. \(\frac{5}{16}\)

12. Suppose the number 4 were added to the second spinner. How many total possible outcomes would there be?
    F. 20  G. 22  H. 24  J. 25

Roll a six-sided number cube and toss a penny.

13. How many possible outcomes are there?
    A. 8  B. 10  C. 12  D. 16

14. What is the probability of rolling an odd number and landing on heads?
    F. \(\frac{1}{2}\)  G. \(\frac{1}{3}\)  H. \(\frac{1}{4}\)  J. \(\frac{3}{4}\)

15. What is the probability of rolling a number greater than 1 and landing on tails?
    A. \(\frac{5}{6}\)  B. \(\frac{7}{12}\)  C. \(\frac{1}{2}\)  D. \(\frac{5}{12}\)

16. What is the probability of rolling a 7 and landing on heads?
    F. \(\frac{0}{12}\)  G. \(\frac{1}{12}\)  H. \(\frac{7}{12}\)  J. \(\frac{12}{12}\)

Solve.

17. Adam went shopping for school supplies. He bought pencils ($0.33 each), folders ($1.15 each), and binders ($2.79 each). Adam spent $5.59. How many of each school supply did he buy?
    A. 17 pencils, 0 folders, 0 binders  B. 5 pencils, 1 folder, 1 binder
    C. 6 pencils, 1 folder, 1 binder  D. 4 pencils, 2 folders, 2 binders

17. ____
Read each question carefully. Write your answer on the line provided.

Carson has 1 pair of gray pants, 4 pairs of jeans, 2 pairs of tan pants, and 1 pair of black pants.

Describe the probability of each outcome.

1. picking jeans without looking
   A. certain     B. likely     C. unlikely     D. impossible

2. picking green pants without looking
   F. certain     G. likely     H. unlikely     J. impossible

3. picking gray pants without looking
   A. certain     B. likely     C. unlikely     D. impossible

4. picking pants that are not red without looking
   F. certain     G. likely     H. unlikely     J. impossible

Roll a six-sided number cube with the numbers 1, 2, 3, 4, 5, and 6 on the faces.

Use a fraction to describe the probability of each outcome.

5. rolling an odd number
   A. $\frac{1}{2}$     B. $\frac{1}{3}$     C. $\frac{1}{4}$     D. $\frac{1}{6}$

6. rolling a less than 5 number
   F. $\frac{1}{2}$     G. $\frac{2}{3}$     H. $\frac{1}{4}$     J. $\frac{1}{6}$

7. rolling a 5
   A. $\frac{1}{2}$     B. $\frac{1}{3}$     C. $\frac{1}{4}$     D. $\frac{1}{6}$

8. rolling a number greater than 2
   F. $\frac{1}{2}$     G. $\frac{1}{3}$     H. $\frac{2}{3}$     J. $\frac{5}{6}$

The grid shows the outcomes of 2 spinners.
9. How many possible outcomes are there?
   A. 25          B. 20          C. 16          D. 9

9. ___

10. What is the probability of spinning at least one 7?
   F. \( \frac{7}{20} \)  G. \( \frac{2}{5} \)  H. \( \frac{1}{2} \)  J. \( \frac{3}{5} \)

10. ___

11. What is the probability of spinning 2 numbers whose sum is less than 11?
   A. \( \frac{1}{5} \)  B. \( \frac{3}{5} \)  C. \( \frac{3}{4} \)  D. \( \frac{4}{5} \)

11. ___

12. Suppose the number 8 were added to the second spinner. How many total possible outcomes would there be?
   F. 25  G. 24  H. 22  J. 20

12. ___

Use the menu for problems 13–16.

<table>
<thead>
<tr>
<th>School Lunch Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meal Choices</td>
</tr>
<tr>
<td>Turkey</td>
</tr>
<tr>
<td>Ham</td>
</tr>
</tbody>
</table>

13. How many possible outcomes are there for choosing a meal and a drink?
   A. 8          B. 10          C. 12          D. 16

13. ___

14. What is the probability of choosing the pizza with juice?
   F. \( \frac{1}{2} \)  G. \( \frac{1}{3} \)  H. \( \frac{1}{6} \)  J. \( \frac{1}{12} \)

14. ___

15. What is the probability of choosing both a meal and a drink that start with the letter “t”?
   A. \( \frac{1}{2} \)  B. \( \frac{1}{3} \)  C. \( \frac{1}{4} \)  D. \( \frac{1}{6} \)

15. ___

16. What is the probability of choosing tuna and milk?
   F. \( \frac{0}{12} \)  G. \( \frac{1}{12} \)  H. \( \frac{7}{12} \)  J. \( \frac{12}{12} \)

16. ___

Paige had 4 coins in her pocket: 1 quarter, 2 nickels, and 1 penny. She randomly picked 1 coin from her pocket. She replaced that coin, and picked another coin.

17. What coins did Paige most likely pick from her pocket?
   A. 1 quarter and 1 penny          B. 1 nickel and 1 penny
   C. 1 quarter and 1 nickel         D. 2 nickels

17. ___
Read each question carefully. Write your answer on the line provided. Use the table for problems 1–4.

### Pants in Carson’s Closet

<table>
<thead>
<tr>
<th>Color</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gray</td>
<td>1</td>
</tr>
<tr>
<td>Jeans</td>
<td>4</td>
</tr>
<tr>
<td>Tan</td>
<td>2</td>
</tr>
<tr>
<td>Black</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Describe the probability of each outcome.

1. picking gray pants without looking  
   - **A.** likely  
   - **B.** unlikely  
   - **C.** impossible  

2. picking green pants without looking  
   - **F.** likely  
   - **G.** unlikely  
   - **H.** impossible  

3. picking jeans without looking  
   - **A.** likely  
   - **B.** equally likely  
   - **C.** impossible  

4. **not** picking red pants without looking  
   - **F.** certain  
   - **G.** unlikely  
   - **H.** impossible  

#### Find the probability of each outcome.

5. picking an odd number  
   - **A.** \( \frac{1}{2} \)  
   - **B.** \( \frac{1}{3} \)  
   - **C.** \( \frac{1}{6} \)  

6. picking a number greater than 2  
   - **F.** \( \frac{1}{3} \)  
   - **G.** \( \frac{2}{3} \)  
   - **H.** \( \frac{5}{6} \)  

7. picking a 5  
   - **A.** \( \frac{1}{2} \)  
   - **B.** \( \frac{1}{3} \)  
   - **C.** \( \frac{1}{6} \)
Chapter Test, Form 2B  (continued)

8. picking a number less than 2
   F. $\frac{1}{2}$  G. $\frac{1}{3}$  H. $\frac{1}{6}$

8. ____

Use the menu for problems 9–11.

<table>
<thead>
<tr>
<th>Meals</th>
<th>Drinks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuna</td>
<td>Water</td>
</tr>
<tr>
<td>Ham burger</td>
<td>Pizza</td>
</tr>
<tr>
<td>Water</td>
<td>Juice</td>
</tr>
<tr>
<td>Milk</td>
<td></td>
</tr>
</tbody>
</table>

9. How many outcomes are there for choosing a meal and a drink?
   A. 10  B. 12  C. 16
   9. ____

10. What is the probability of choosing pizza and juice?
    F. $\frac{1}{3}$  G. $\frac{1}{6}$  H. $\frac{1}{12}$
    10. ____

11. What is the probability of choosing a meal and a drink that both begin with “t”?
    A. $\frac{1}{2}$  B. $\frac{1}{3}$  C. $\frac{0}{12}$
    11. ____

Use the grid for problems 12–15.

The grid shows the outcomes of 2 spinners.

<table>
<thead>
<tr>
<th>First Spinner Outcomes</th>
<th>Second Spinner Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 3,0 3,1 3,2 3,4</td>
<td></td>
</tr>
<tr>
<td>4 4,0 4,1 4,2 4,4</td>
<td></td>
</tr>
<tr>
<td>5 5,0 5,1 5,2 5,4</td>
<td></td>
</tr>
<tr>
<td>6 6,0 6,1 6,2 6,4</td>
<td></td>
</tr>
<tr>
<td>7 7,0 7,1 7,2 7,4</td>
<td></td>
</tr>
</tbody>
</table>

12. How many outcomes are there?
    A. 25  B. 20  C. 16
    12. ____

13. What is the probability of spinning 2 numbers whose sum is less than 11?
    F. $\frac{1}{5}$  G. $\frac{18}{20}$  H. $\frac{19}{20}$
    13. ____

14. What is the probability of spinning at least one 7?
    A. $\frac{7}{20}$  B. $\frac{1}{5}$  C. $\frac{3}{5}$
    14. ____

15. Suppose the number 8 were added to the second spinner. How many outcomes would there be?
    F. 25  G. 24  H. 22
    15. ____
Chapter Test, Form 2C

Read each question carefully. Write your answer on the line provided.

Carson is always in a rush. In the morning, he picks a pair of pants from his closet without even looking. Carson has 1 pair of gray pants, 4 pairs of jeans, 2 pairs of tan pants, and 1 pair of black pants.

Describe the probability of each outcome. Write certain, likely, unlikely, or impossible.

1. picking a pair of pants that is not red
2. picking a pair of jeans
3. picking a pair of gray pants
4. picking a pair of green pants

Roll a six-sided number cube with the numbers 1, 2, 3, 4, 5, and 6 on the faces.

Use a fraction to describe the probability of each outcome.

5. rolling a number greater than 2
6. rolling an even number
7. rolling a 5
8. rolling an odd number

The grid shows the outcomes of 2 spinners.

<table>
<thead>
<tr>
<th>First Spinner Outcomes</th>
<th>Second Spinner Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>3,0</td>
</tr>
<tr>
<td>4</td>
<td>4,0</td>
</tr>
<tr>
<td>5</td>
<td>5,0</td>
</tr>
<tr>
<td>6</td>
<td>6,0</td>
</tr>
<tr>
<td>7</td>
<td>7,0</td>
</tr>
</tbody>
</table>
9. How many possible outcomes are there?

10. What is the probability of spinning 2 numbers whose sum is less than 11?

11. Suppose the number 8 were added to the second spinner. How many total possible outcomes would there be?

12. What is the probability of spinning at least one 7?

Use the menu for problems 13–16.

<table>
<thead>
<tr>
<th>School Lunch Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meal Choices</td>
</tr>
<tr>
<td>Chicken</td>
</tr>
<tr>
<td>Ham</td>
</tr>
</tbody>
</table>

13. How many possible outcomes are there for choosing a meal and a drink?

14. What is the probability of choosing tacos and juice? Express your answer as a fraction in simplest form.

15. What is the probability of choosing soup and milk? Express your answer as a fraction in simplest form.

16. What is the probability of choosing chicken with tea? Express your answer as a fraction in simplest form.

Solve

17. Sonya went shopping for sports equipment. She spent a total of $56.

How many of each item did Sonya buy?
Chapter Test, Form 2D

Read each question carefully. Write your answer on the line provided.

Pants in Carson’s Closet

<table>
<thead>
<tr>
<th>Color</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gray</td>
<td>1</td>
</tr>
<tr>
<td>Jeans</td>
<td>4</td>
</tr>
<tr>
<td>Tan</td>
<td>2</td>
</tr>
<tr>
<td>Black</td>
<td>1</td>
</tr>
</tbody>
</table>

Describe the probability of each outcome. Use certain, likely, unlikely, or impossible.

1. not picking red pants
2. picking black pants
3. picking gray pants
4. picking green pants

Find each probability as a fraction in simplest form.

5. picking a number greater than 2
6. picking a composite number
7. picking a 5
8. picking an odd number

The grid shows the outcomes of 2 spinners.

<table>
<thead>
<tr>
<th>Second Spinner Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
</tbody>
</table>

9. How many outcomes are there?

10. What is the probability of spinning 2 numbers whose sum is less than 6? Write as a fraction in simplest form.
11. What is the probability of spinning at least one 7? Write as a fraction in simplest form.

12. Suppose the number 6 were added to the second spinner. How many outcomes would there be?

Use the menu for problems 13–16.

<table>
<thead>
<tr>
<th>Lunch Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meal Choices</strong></td>
</tr>
<tr>
<td>Turkey</td>
</tr>
<tr>
<td>Ham</td>
</tr>
<tr>
<td>Tacos</td>
</tr>
</tbody>
</table>

13. How many outcomes are there for choosing a meal and a drink?

14. What is the probability of choosing both a meal and a drink that start with the letter “t”? Write as a fraction in simplest form.

15. What is the probability of choosing a cheeseburger and milk? Write as a fraction in simplest form.

16. What is the probability of choosing turkey with juice? Write as a fraction in simplest form.

Jennie had 4 coins in her pocket: 1 quarter, 2 nickels, and 1 penny. She randomly picked 1 coin from her pocket. She replaced that coin, and picked another coin.

17. What two coins did Jennie most likely pick from her pocket?

18. What is the probability that Jennie picked a total of more than $0.09? Write as a fraction in simplest form.

Solve.

19. Isabel, Kate, Julie, and Sonya are in a relay race. Sonya runs either first or second. Kate does not run first or last. Isabel does not run first, third, or fourth. Order the students from first to last.
Read each question carefully. Write your answer on the line provided.

Jill is not concerned with fashion. In her morning rush, she grabs a shirt from her drawer without even looking. Jill has 1 polka-dotted shirt, 4 striped shirts, 2 plaid shirts, and 1 flowered shirt.

**Describe the probability of each outcome. Write certain, likely, unlikely, or impossible.**

1. picking a shirt that does not have polka dots
2. picking a striped shirt
3. picking a flowered shirt

**Use a fraction to describe the probability of each outcome.**

4. picking C
5. picking a vowel
6. picking a letter that comes after R in alphabetical order

Kira and Pat are playing the game Rock, Scissors, Paper. Each player chooses a sign, Rock, Scissors, or Paper. Rock beats Scissors, Scissors beat Paper, and Paper beats Rock. If the players make the same sign, they tie.

**7. Draw a tree diagram for the situation.**

8. What is the probability that Kira and Pat will tie? Express your answer as a fraction in simplest form.
Chapter Test, Form 3  (continued)

9. What is the probability that Pat will beat Kira? Express your answer as a fraction in simplest form.

10. Suppose each player had another choice: Super Scissors. What would be the total number of possible outcomes?

Use the menu for problems 11–14.

<table>
<thead>
<tr>
<th>School Lunch Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meal Choices</td>
</tr>
<tr>
<td>Turkey</td>
</tr>
<tr>
<td>Ham</td>
</tr>
<tr>
<td>Tamales</td>
</tr>
<tr>
<td>Pizza</td>
</tr>
</tbody>
</table>

Choose one meal, one side dish, and one drink.

11. How many possible outcomes are there?

12. What is the probability of choosing a meal and a drink that both start with the letter “t”? Express your answer as a fraction in simplest form.

13. What is the probability of choosing a hamburger, macaroni and cheese, and milk?

14. What is the probability of choosing the pizza or tamales, rice, and tea or juice?

Solve.

15. Gil spins a spinner 100 times. He spins an even number every time. What conclusion can you draw about the numbers on the spinner?

16. There are 12 writing utensils in Cara’s pencil case. The probability of picking a pen from her pencil case is \( \frac{1}{4} \). The probability of picking a marker is \( \frac{1}{3} \). The probability of picking a crayon is \( \frac{5}{12} \). How many pens, markers, and crayons are in Cara’s pencil case?
Chapter Extended-Response Test

Demonstrate your knowledge by giving a clear, concise solution to each problem. Be sure to include all relevant drawings and justify your answers. You may show your solution in more than one way or investigate beyond the requirements of the problem. If necessary, record your answer on another piece of paper.

1. Carl has 10 colored pencils in his backpack. Six are blue, 2 are red, 1 is black and 1 is green. If Carl reaches into his backpack and grabs a pencil without looking, what color will it be?
   a. Make a table to show the possible outcomes.
   b. Describe the probability, in words and numbers, of Carl pulling out a blue pencil.
   c. Describe the probability, in words and numbers, of Carl pulling out a red pencil.
   d. Describe the probability, in words and numbers, of Carl pulling out a pencil that isn’t brown.
   e. Describe the probability, in words and numbers, of Carl pulling out a pencil that is either black or green. Is he more likely to pull out a green pencil or a black pencil?

2. 

![Circle diagram with sections for Red, Yellow, Blue, Green, and Pink]

   a. Use a fraction and words to describe the probability of landing on a primary color.
   b. Use a fraction and words to describe the probability of landing on either yellow or green.
   c. Use a fraction and words to describe the probability of landing on pink.
   d. Use a fraction and words to describe the probability of landing on the color gray.
Read each question. Then fill in the correct answer.

1. A B C D

2. F G H J

3. A B C D

4. F G H J

5. A B C D

6. F G H J

7. A B C D

8. F G H J

9. A B C D

10. F G H J
Test Example

Paul has a bag of pencils. Of the 12 pencils, 2 are blue, 1 is green, 6 are red, and 3 are yellow. Which color is likely to be pulled out of the bag?

A. blue  B. green  C. red  D. yellow

Read the Question

You need to find the color that is likely to be pulled out of the bag.

Solve the Question

Use what you know to predict the events.

There are 12 pencils in the bag. There are 2 blue, 1 green, and 3 yellow pencils. So, it is unlikely these colors will be pulled.

Six of the pencils are red. So, it is likely red will be pulled.

The answer is C.

Choose the best answer.

1. Lynn has a box of ribbons. Of the 20 ribbons, 7 are blue, 3 are red, 8 are green, and 2 are yellow. If Lynn chooses a ribbon without looking, which color is she most likely to choose?

A. blue  B. red  C. green  D. yellow  1. ____

2. Three pens, two red and one black, are placed in an envelope. What is the probability of choosing a red pen from the envelope without looking?

F. 1  G. \(\frac{1}{3}\)  H. \(\frac{2}{3}\)  J. 2  2. ____

3. The tree diagram below shows the possible outcomes for David’s shoe and sock choices.

How many different shoe-and-sock combinations can David wear?

A. 3  B. 5  C. 6  D. 12  3. ____
4. Admission to the art museum is $18 for adults and $7 for children. How much will admission cost for 2 adults and 4 children?
   F. $62.00  G. $64.00  H. $68.00  J. $70.00

5. Robby tossed a number cube labeled 1–6. What is the probability that he will toss a 1, 3 or 5?
   A. \( \frac{1}{5} \)  B. \( \frac{1}{4} \)  C. \( \frac{1}{3} \)  D. \( \frac{1}{2} \)

6. Which is the value of the digit 8 in 368,231?
   F. 800,000  G. 80,000  H. 8,000  J. 800

7. What is the value of the expression below?
   \( (57 + 7) \div (2 \times 4) \)
   A. 6  B. 7  C. 8  D. 9

8. Which is the best estimate for 419 ÷ 6?
   F. 40  G. 50  H. 60  J. 70

9. What is the value of the expression below if \( y = 6 \)?
   \( 81 \div (y + 3) \)
   A. 9  B. 11  C. 13  D. 21

10. Susan experimented with two different spinners. The grid shows her results:

    | Spinner results |
    | a   | b   | c   | d   |
    |-----|-----|-----|-----|
    | 2   | 2, a| 2, b| 2, c|
    | 4   | 4, a| 4, b| 4, c|
    | 6   | 6, a| 6, b| 6, c|
    | 8   | 8, a| 8, b| 8, c|

What is the probability that Nicole will spin d and an even number?
   F. \( \frac{1}{2} \)  G. \( \frac{1}{4} \)  H. \( \frac{1}{6} \)  J. \( \frac{1}{8} \)
Use a fraction and words to describe the probability of each outcome.

11. Landing on a primary color __________

12. Landing on either pink or green __________

13. Landing on blue __________

14. Landing on black __________

Use the grid to answer each question.

<table>
<thead>
<tr>
<th>Flower colors ↓</th>
<th>Clay</th>
<th>Plastic</th>
<th>Metal</th>
</tr>
</thead>
<tbody>
<tr>
<td>red</td>
<td>red, clay</td>
<td>red, plastic</td>
<td>red, metal</td>
</tr>
<tr>
<td>purple</td>
<td>purple, clay</td>
<td>purple, plastic</td>
<td>purple, metal</td>
</tr>
<tr>
<td>white</td>
<td>white, clay</td>
<td>white, plastic</td>
<td>white, metal</td>
</tr>
<tr>
<td>yellow</td>
<td>yellow, clay</td>
<td>yellow, plastic</td>
<td>yellow, metal</td>
</tr>
</tbody>
</table>

15. How many possible combinations of flowers and pots are there?  
16. What is the probability of planting a flower in a clay pot?
1. Order the numbers from greatest to least.
   12,740, 20,147, 12,074, 21,004

2. Compare. Use >, <, or =. 365,039 □ 356,903

3. In 2005, the population of California was 36,132,147. Write this number in expanded form.

4. 5,035
   \[\text{–} \quad 78\]

5. $447.72
   \[\text{–} \quad $26.08\]

6. Complete the equation to make it balanced.
   \[42 + 6 = 20 + 22 + \boxed{?}\]

7. Write a rule as an equation to describe the pattern in the table.

<table>
<thead>
<tr>
<th>Input (x)</th>
<th>Output (y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>4</td>
</tr>
<tr>
<td>14</td>
<td>5</td>
</tr>
</tbody>
</table>

8. Vincent is 13 years younger than Angela. If Vincent is 7, how old is Angela?
9. Look at the line graph below.

About how many cones were sold in October?  

10. Robert’s science test scores are listed below.

\{71, 69, 88, 75, 90, 88, 73\}

What was Robert’s median test score?  

11. What two composite numbers are greater than 16 and less than 21?  

12. Complete the number sentence.

\[77 \div \square = 11\]  

13. Tim reads 35 pages of a book every night. How many pages does he read in 5 nights?  

14. Find the value of \(4 + 12 \times p\) if \(p = 6\).  

15. Evan and Allison are sewing. Evan gives Allison 8 yards of fabric. Then Evan uses 6 yards of fabric. If Evan has 19 yards of fabric left, how many yards of fabric did he have originally?  

16. \[
\begin{array}{c}
7,891 \\
\times 6
\end{array}
\]  

17. Find the value of \(y\).

\[6,093 \times 5 = y\]  

18. Jeffrey drives 47 miles in one hour. If he stays at this speed, how many miles will he drive in 8 hours?  

19. \(\$6,019 \times 38\)  

20. There are 60 minutes in an hour and 24 hours in a day. How many minutes are there in a day?
21. \(4\sqrt{787}\)

22. \(6,016 \div 4\)

23. There are 119 students in fourth grade at Heidi’s school. The students are divided among 4 classes. About how many students are in each class?

24. Identify the triangle below as **isosceles**, **equilateral**, or **scalene** and **acute**, **right** or **obtuse**.

25. \(\overline{OK}\) is the _____ of the circle.

26. How many lines of symmetry does the figure have?

27. Find the perimeter.

28. A rectangle has an area of 91 square inches and a width of 7 inches. What is the length of the rectangle?

29. Look at the coordinate plane. What ordered pair names point A?
30. Look at the function table. What is the missing value?

<table>
<thead>
<tr>
<th>Rule: $3x + x$</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Input $(x)$</td>
<td>Output $(y)$</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>16</td>
</tr>
</tbody>
</table>

31. Find the value of $x$ to simplify the fraction.

$$\frac{18}{27} = \frac{2}{x}$$

32. Order $\frac{5}{9}$, $\frac{11}{27}$, and $\frac{7}{12}$ from least to greatest.

33. Write $\frac{38}{8}$ as a mixed number in simplest form.

34. The heights of four students are displayed in the table below. Order the students from tallest to shortest.

<table>
<thead>
<tr>
<th>Student</th>
<th>Height (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michael</td>
<td>149.49</td>
</tr>
<tr>
<td>Nina</td>
<td>148.99</td>
</tr>
<tr>
<td>Malan</td>
<td>149.04</td>
</tr>
<tr>
<td>Bonnie</td>
<td>149.4</td>
</tr>
</tbody>
</table>

35. Write $\frac{6}{100}$ as a decimal.

36. Keith walked 4.91 miles on Wednesday, 3.4 miles on Thursday, and 2.09 miles on Friday. To the nearest whole mile, about how many miles did Keith walk in all?

37. \[
\begin{align*}
43.07 \\
- &\ 7.8 \\
\hline
&\ 35.29
\end{align*}
\]

Use the information below for problems 38 and 39.

Niki rolls a six-sided number cube with sides labeled 1 through 6.

38. Is the probability of rolling a number greater than 5 impossible, unlikely, likely, or certain?

39. What is the probability that Niki will roll an odd number?
What is the probability of picking a triangle out of the bag? Check the appropriate box.

<table>
<thead>
<tr>
<th></th>
<th>Certain</th>
<th>Likely</th>
<th>Unlikely</th>
<th>Impossible</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Anticipation Guide**

**Probability**

**STEP 1** Before you begin Chapter 16
- Read each statement.
- Decide whether you agree (A) or disagree (D) with the statement.
- Write A or D in the first column OR if you are not sure whether you agree or disagree, write NS (not sure).

<table>
<thead>
<tr>
<th>Statement</th>
<th>STEP 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Probability is a number between 0 and 1 that measures the likelihood of an event happening.</td>
<td>A</td>
</tr>
<tr>
<td>2. An outcome is a possible result of an experiment.</td>
<td>A</td>
</tr>
<tr>
<td>3. Desired results in a probability experiment are unfavorable outcomes.</td>
<td>D</td>
</tr>
<tr>
<td>4. A prediction is something that will definitely happen.</td>
<td>D</td>
</tr>
<tr>
<td>5. A tree diagram is a diagram of all the possible outcomes of an event or series of events or experiments.</td>
<td>A</td>
</tr>
<tr>
<td>6. A fraction is a number that represents part of a whole or part of a set.</td>
<td>A</td>
</tr>
<tr>
<td>7. ( \frac{1}{2} ) is a fraction.</td>
<td>A</td>
</tr>
<tr>
<td>8. 65 is a fraction.</td>
<td>D</td>
</tr>
<tr>
<td>9. 5.9 is a fraction.</td>
<td>D</td>
</tr>
<tr>
<td>10. Just because a prediction is made, it doesn’t mean it will happen.</td>
<td>A</td>
</tr>
</tbody>
</table>

**STEP 2** After you complete Chapter 16
- Reread each statement and complete the last column by entering an A (agree) or a D (disagree).
- Did any of your opinions about the statements change from the first column?
- For those statements that you mark with a D, use a separate sheet of paper to explain why you disagree. Use examples, if possible.
The chance, or likelihood, that something will happen is called probability.

Look at the spinner at the right. You could spin 1, 2, 3, 4, 5, or 6. There are 6 possible outcomes.

- The probability of spinning each number is equally likely.
- It is impossible to spin an 8.
- It is certain that you will spin a number greater than 0.

Look at the spinner at the right.
- The probability of spinning a 7 is unlikely.
- The probability of spinning an 8 is likely.

Describe the probability of picking a certain shape from the bag. Use certain, likely, equally likely, unlikely, or impossible to describe the probability.

1. The probability of picking a red ball is impossible.
2. It is likely that you will land on a number greater than 2.
3. It is unlikely that you will land on a number less than 2.
4. It is certain that you will land on a number less than 9.
5. It is certain or equally likely that you will land on an odd or even number.
6. It is impossible to land on a number greater than 8.

Describe the probability of each outcome. Use certain, likely, equally likely, unlikely, or impossible.

1. spinning 2 unlikely
2. spinning 3 impossible
3. spinning 6 equally likely
4. spinning 1 certain
5. spinning 2 likely
6. spinning 3 unlikely
7. spinning 6 unlikely
8. spinning 1 equally likely
9. spinning 3 or 4 equally likely
10. spinning 1, 2, 3, or 4 certain

Describe the probability of each outcome. Use certain, likely, equally likely, unlikely, or impossible.

11. The month after September will be November. impossible
12. It will be sunny or rainy tomorrow. Answers may vary.
13. It will snow in Alaska this year. certain

Solve.

14. A bag contains 3 red and 7 white balls. Is it unlikely, likely, or equally likely you will pick a red ball? unlikely
15. A box contains 6 red pencils and 6 black pencils. Is it unlikely, likely, or equally likely you will pick a red pencil? equally likely
Homework Practice
Probability and Outcomes

Describe the probability of each outcome. Use certain, likely, equally likely, unlikely, or impossible.

1. Spinning an even number **equally likely**
2. Spinning a 2 **unlikely**
3. Spinning a 4, 5, or 6 **equally likely**
4. Spinning a 7 **impossible**
5. Spinning a 1, 2, 3, 4, 5, or 6 **certain**

Create a table to show the possible outcomes for the situation. Then, use the table to describe the probability of the outcome.

6. Jorge is picking something for dinner. He has 2 boxes of pasta, 3 boxes of rice, and 7 types of meat. If he picks one randomly, describe the probability of picking a meat.

Spiral Review
Subtract. (Lesson 15–6)

7. 13.87
   - 6.42
   **7.45**

8. 21.66
   - 13.56
   **8.10**

9. 18.04
   - 9.75
   **8.29**

10. $8.99
    - $3.15
    **$5.84**

11. $16.05
    - $7.33
    **$8.72**

12. $12.50
    - $9.95
    **$2.55**

Problem-Solving Practice
Probability and Outcomes

Describe the probability of each outcome. Use certain, likely, equally likely, unlikely, or impossible.

1. spinning a star or a sun **equally likely**
2. spinning a butterfly **equally likely**
3. spinning a baseball or bat **equally likely**
4. spinning a catcher’s mitt **unlikely**
5. spinning a hot dog or a hamburger **equally likely**
6. probability of spinning a soda **unlikely**
Use this number line to plot probabilities. Write the number of each outcome described above the place where you think it belongs.

- 0
- 1
- 2
- 3
- 4
- 5

won’t happen
will happen

1. The weatherman predicts a 75% chance of snow.

2. Your uncle buys one lottery ticket and wins $1,000,000.

3. Tuesday will follow Monday next week.

4. Lewis flips a coin and gets tails.

5. Deborah, who is holding three quarters, two dimes, and one nickel, accidentally drops one of the dimes.

You can use a fraction to show probability. You can use probability to predict an outcome.

Probability = \( \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}} \)

Use a fraction to describe the probability of each outcome.

1. \( \frac{1}{6} \) or \( \frac{1}{3} \)

2. \( \frac{3}{6} \) or \( \frac{1}{2} \)

3. \( \frac{2}{6} \) or \( \frac{1}{3} \)

4. \( \frac{0}{6} \) or 0

Use a fraction to describe the probability of each outcome.

5. \( \frac{5}{10} \) or \( \frac{1}{2} \)

6. \( \frac{3}{10} \)

7. \( \frac{1}{10} \)

8. \( \frac{1}{10} \)

Use a fraction to describe the probability of each outcome.

9. a pencil \( \frac{2}{12} \) or \( \frac{1}{6} \)

10. a pen \( \frac{4}{12} \) or \( \frac{1}{3} \)

11. an eraser \( \frac{0}{12} \) or 0

12. a pair of scissors \( \frac{2}{12} \) or \( \frac{1}{6} \)

13. a pad of paper \( \frac{1}{12} \)

14. a crayon \( \frac{3}{12} \) or \( \frac{1}{4} \)
Skills Practice
Probability and Fractions

Use a fraction to describe the probability of each outcome.

1. \( \frac{2}{12} \) or \( \frac{1}{6} \)
2. \( \frac{1}{12} \)
3. \( \frac{6}{12} \) or \( \frac{1}{2} \)
4. \( \frac{3}{12} \) or \( \frac{1}{4} \)
5. \( \frac{8}{12} \) or \( \frac{2}{3} \)
6. \( \frac{0}{12} \) or \( 0 \)

Use a fraction to describe the probability of each outcome.

7. circle \( \frac{1}{10} \)
8. triangle \( \frac{3}{10} \)
9. square \( \frac{2}{10} \) or \( \frac{1}{5} \)
10. pentagon \( \frac{4}{10} \) or \( \frac{2}{5} \)
11. hexagon \( 0 \)
12. triangle or square \( \frac{5}{10} \) or \( \frac{1}{2} \)

Use a fraction to describe the probability of each outcome.

13. blue \( \frac{3}{8} \)
14. red \( \frac{4}{8} \) or \( \frac{1}{2} \)
15. green \( \frac{1}{8} \)
16. purple \( \frac{0}{8} \) or \( 0 \)
17. red or blue \( \frac{7}{8} \)
18. blue or green \( \frac{4}{8} \) or \( \frac{1}{2} \)

Solve.

19. Greg has a coin in one of his closed hands. What is the probability that Greg's friend will pick the hand the coin is in?

\( \frac{1}{2} \)

20. Karen turns 5 paper cups. She hides a coin under one of them. What is the probability that Steven will guess which cup the coin is under?

\( \frac{1}{5} \)

Homework Practice
Probability and Fractions

A shape is picked from the bag. Use a fraction and words to describe the probability of each outcome.

1. Picking a square \( \frac{6}{9} \) or \( 6 \) out of \( 9 \)
2. Picking a circle \( \frac{1}{9} \) or \( 1 \) out of \( 9 \)
3. Picking a rectangle \( \frac{0}{9} \) or \( 0 \) out of \( 9 \)
4. Picking a triangle \( \frac{2}{9} \) or \( 2 \) out of \( 9 \)
5. Picking a square or triangle \( \frac{8}{9} \) or \( 8 \) out of \( 9 \)

Spiral Review
Describe the probability of each outcome. Use certain, likely, equally likely, unlikely, or impossible. (Lesson 16-1)

6. If Patricia picks out 1 fruit without looking, what is the probability that she will pick an apple? unlikely
7. If Jane picks out a fruit without looking, what is the probability that she will pick a banana? likely
8. If Mike picks out a fruit without looking, what is the probability that he will pick an orange? impossible
**Problem-Solving Practice**

*Probability and Fractions*

Use the spinner to solve.

1. Rita and Jose are playing a game. They decide that the first person to land on the star will go first. What is the probability of landing on the star? Express the probability as a fraction.
   
   $\frac{1}{8}$

2. Rita and Jose take turns using the spinner. The first person to land on all four shapes wins the game. Rita goes first. What is the probability that she will land on a circle? Express the probability as a fraction.
   
   $\frac{3}{8}$

3. Jessica and Bianca are playing a game. Each player has to name the shape she thinks she will land on before spinning. Bianca thinks she will land on a triangle. What is the probability that she will land on the triangle? Express it as a fraction.
   
   $\frac{1}{8}$

4. Jessica thinks she will land on a square. What is the probability that she will land on a square? Express it as a fraction.
   
   $\frac{2}{1} \frac{1}{8}$

5. Simon and Luis are playing a game using the spinner. If the object of the game is to land on each shape before the other player, what shape would be the most difficult to land on? Express the probability of landing on that shape as a fraction.
   
   Star
   
   $\frac{1}{8}$

6. Simon goes first. What shape is he most likely to land on? Express the probability as a fraction.
   
   Circle
   
   $\frac{3}{8}$

**Enrich**

*Soccer Match*

Keith is a midfielder on the Eagles soccer team. Their next game is against the Falcons. Keith thinks the Eagles will win. Then again he thinks the Eagles might lose. According to Keith, the probability of the Eagles winning is $\frac{1}{2}$.

What is wrong with Keith’s thinking?

**Answers will vary, but students should point out that there is also the possibility of a tie game, which would make a third possible outcome. That would make the fraction $\frac{1}{3}$.**

Able students may also point out that it’s not really $\frac{1}{3}$, because the three possible outcomes aren’t random occurrences. One team’s goalie might be sick, or one team might practice more, etc.
Otto plays a game. He spins the two spinners shown below and finds the product of the numbers he lands on. What products can Otto make?

Step 1 Understand

Be sure you understand the problem.
Read carefully.
What facts do you know?

• Spinner A is marked 3 and 2
• Spinner B is marked 4, 5, and 8

What do you need to find?

• What products Otto can make.

Step 2 Plan

Make a plan. Choose a strategy.
You can make an organized list to solve the problem.
Remember: A product is the answer to a multiplication problem.

Step 3 Solve

Carry out your plan.

Make a list of all the possible spinner products.
Then find each product.

<table>
<thead>
<tr>
<th>Spinner A</th>
<th>Spinner B</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>16</td>
</tr>
</tbody>
</table>

What products can Otto make? 8, 10, 12, 15, 16, 24

Step 4 Check

Is the solution reasonable?
Reread the problem. Have you answered the question? Yes

How can you check your answer? Answers may vary.
Possible answer: Check each of the products in the list to make sure each one has a factor from Spinner A and a factor from Spinner B.

Practice

1. A spinner has 3 equal sections that are white, yellow, and green.
   Another spinner has 3 equal sections that are blue, purple, and red. How many different combinations of colors are possible if you spin each spinner once? 9 combinations
Skills Practice

Problem-Solving Strategy

Solve. Use the make an organized list strategy.

1. Juanita had 12 pencils in a box. She needed 144 for a school wide test. How many boxes will she need?
   12 boxes

2. Jared runs 4 laps around the track 3 times a week. How many laps does he run in 1 month? 6 weeks?
   48 laps  72 laps

3. Alicia bought 2 sweaters for the price of one pair of jeans. The jeans cost twice the amount of the sweaters. She gave the cashier 4 twenty-dollar bills, and she received $4 back in change. How much did the sweaters cost? How much were the jeans?
   $19.00  $38.00

4. Ally has a choice of 3 different pairs of socks including red, white, or black. If she reaches into her drawer and randomly chooses a pair, what is the probability that she will choose white?
   1/3

5. Drake wants to buy a CD for his mother's birthday. It costs $18.99. He makes $4.50 for mowing the lawn, and $5.49 for cleaning. How many times must he do each chore to make enough money for the CD?
   mow the lawn 3 times and clean once

6. Juan could make banana bread, apple bread, or muffins. He could use whole wheat flour or white flour. How many possible combinations can he make?
   6 combinations

Homework Practice

Problem-Solving Strategy

Solve. Use the make an organized list strategy.

1. Koko has red shorts and blue shorts, and a print shirt, a T-shirt, or a tank top to wear. How many different outfits can he choose from?
   6 combinations

2. Parker is handing out snacks. He has a large bag that is filled with smaller snack-sized bags. There is one bag of each of the following; peanuts, almonds, walnuts, mixed nuts, macadamia nuts, and cashews. What is the probability of picking a bag of macadamia nuts or almonds? How about cashews, almonds, or peanuts?
   2/6 or 1/3  or 1/2

3. Martin's older brother wanted to buy a leather bomber jacket. It cost $190. He makes $38 each weekend mowing lawns and weeding gardens for neighbors. How many weekends will he need to work in order to buy the jacket?
   5 weekends

4. Your teacher has 3 different stickers she can choose from including smiley faces, animals, or hearts. What is the probability of her choosing a heart if she picks one without looking?
   1/3

Spiral Review

One shape is picked. Use words and a fraction to describe the probability of each outcome. Use certain, likely, equally likely, unlikely, or impossible. (Lesson 16-2)

5. Picking a triangle?
   3/8  3 out of 8
   Since 3/8 is less than half, it is unlikely.
The principal keeps a dish of mints on her desk. She offered a piece to Sebastian when he turned in $3 he found on the playground. Half of the mints in the bowl had red wrappers. Without looking he grabbed a piece with a yellow wrapper. His chances of doing that again were 3 out of 23.

Use the information above to write a reasonable description of the principal’s bowl of mints.

For example, there were 24 mints in the bowl before Sebastian took one. Twelve had red wrappers. Four had yellow wrappers. That leaves 8 other pieces that might have blue or green or other colors of wrappers.

Suppose you are playing a game with a spinner. Each player spins the spinner twice. The spinner has four colors: yellow, blue, pink, and green. You can make a grid to show all of the possible outcomes of spinning the spinner. Each outcome is shown where each row and column intersect.

<table>
<thead>
<tr>
<th>First Spin</th>
<th>Yellow (Y)</th>
<th>Blue (B)</th>
<th>Pink (P)</th>
<th>Green (G)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow (Y)</td>
<td>YY</td>
<td>YB</td>
<td>YP</td>
<td>YG</td>
</tr>
<tr>
<td>Blue (B)</td>
<td>BY</td>
<td>BB</td>
<td>BP</td>
<td>BG</td>
</tr>
<tr>
<td>Pink (P)</td>
<td>PY</td>
<td>PB</td>
<td>PP</td>
<td>PG</td>
</tr>
<tr>
<td>Green (G)</td>
<td>GY</td>
<td>GB</td>
<td>GP</td>
<td>GG</td>
</tr>
</tbody>
</table>

Use the grid to answer each question.

1. How many possible outcomes are there? 16
2. What is the probability of spinning the same color on both spins? 4 out of 16; \( \frac{4}{16} \cdot \frac{1}{4} \)
3. What is the probability of spinning yellow on the first spin? 1 out of 4; \( \frac{1}{4} \)
4. What is the probability of spinning red on the second spin? impossible; red is not a color on the spinner
Skills Practice
Find Probability

Pablo is playing a game that involves taking two turns picking a colored disc from a bag without looking. There are a total of three discs: blue, white, and yellow. The grid shows the possible outcome of the two picks.

<table>
<thead>
<tr>
<th>First Pick</th>
<th>Blue (B)</th>
<th>White (W)</th>
<th>Yellow (Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue (B)</td>
<td>BB</td>
<td>BW</td>
<td>BY</td>
</tr>
<tr>
<td>White (W)</td>
<td>WB</td>
<td>WW</td>
<td>WY</td>
</tr>
<tr>
<td>Yellow (Y)</td>
<td>YB</td>
<td>YW</td>
<td>YY</td>
</tr>
</tbody>
</table>

Use the grid to answer each question.

1. How many possible outcomes are there? 9
2. What is the probability of picking 2 white discs? 1 out of 9; \( \frac{1}{9} \)
3. What is the probability of picking two discs of the same color? 3 out of 9; \( \frac{3}{9} \) or \( \frac{1}{3} \)
4. Julia is competing in the finals of an archery competition. She is allowed two more turns to hit the middle of the target. Create a grid to show all of the possible outcomes for her two tries. Use the grid to find the probability of Julia hitting the target twice.

<table>
<thead>
<tr>
<th>First Try</th>
<th>Miss</th>
<th>Hit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second Try</td>
<td>Miss, Miss</td>
<td>Miss, Hit</td>
</tr>
<tr>
<td>Hit</td>
<td>Hit, Miss</td>
<td>Hit, Hit</td>
</tr>
</tbody>
</table>

1 out of 4; \( \frac{1}{4} \)

Homework Practice
Find Probability

The grid shows the outcomes of two spinners. Use the grid to answer each question.

<table>
<thead>
<tr>
<th>First Spinner</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1,1</td>
</tr>
<tr>
<td>2</td>
<td>1,2</td>
</tr>
<tr>
<td>3</td>
<td>1,3</td>
</tr>
<tr>
<td>4</td>
<td>1,4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second Spinner Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

1. How many possible outcomes are there? 16
2. How many outcomes contain a pair of the same number? 3 out of 16
3. What is the probability of spinning two numbers that total 4? 3 out of 16
4. What is the probability of spinning two numbers that have a product of 6? 2 out of 16
5. What is the probability of an outcome that contains the number 1? 7 out of 16
6. What is the probability of spinning two numbers that are both greater than 2? 4 out of 16

Spiral Review
You pick one card. Use a fraction and words to describe the probability of each outcome. (Lesson 16-3)

- \( \frac{4}{10} \) since \( \frac{4}{10} \) is less than half, it is unlikely.

7. Picking a pentagon? 4 out of 10
Problem-Solving Practice

Find Probability

Use the spinner to solve.

1. Mr. Avery has a nature game in his classroom. The game has a spinner with a fish, a frog, and 2 turtles. Paco uses the spinner to make predictions. If Paco spins the spinner 100 times, what is a reasonable prediction of the number of times that he will land on a fish?

   **25 times**

2. If Paco spins the spinner 50 times, what is a reasonable prediction of the number of times that he will land on a turtle?

   **25 times**

3. Jerome uses the nature spinner to make predictions. If Jerome spins the spinner 100 times, what is a reasonable prediction of the number of times that he will land on a turtle?

   **50 times**

4. If Melanie spins the spinner 50 times, what is a reasonable prediction that it will land on a frog or a fish?

   **25 times**

5. Maggie is conducting an experiment with the nature spinner. If Maggie spins the spinner 100 times, what is a reasonable prediction of the number of times that she will land on a turtle or a frog?

   **75 times**

6. Maggie will spin the spinner 50 times. She predicts that the spinner will land on the frog about 12 times. Is her prediction reasonable?

   Yes

   Explain your thinking: The probability of landing on the frog is 1 out of 4, so it is reasonable to predict that the spinner will land on the frog about 12 times out of 50.

   **25 times**

Enrich

Nine Out of Ten

Complete this probability chart. Make up your own problem for number 10, and trade with a partner to check your answers.

<table>
<thead>
<tr>
<th>Random Event</th>
<th>Desired Outcome</th>
<th>Desired Outcome Possibilities</th>
<th>Total Outcome Possibilities</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pick a letter from the alphabet</td>
<td>Vowel</td>
<td>5</td>
<td>26</td>
<td>$\frac{5}{26}$</td>
</tr>
<tr>
<td>2. Pick a card from a full deck</td>
<td>Heart</td>
<td>13</td>
<td>52</td>
<td>$\frac{1}{4}$</td>
</tr>
<tr>
<td>3. Pick a card from a full deck</td>
<td>Eight</td>
<td>4</td>
<td>52</td>
<td>$\frac{1}{13}$</td>
</tr>
<tr>
<td>4. Toss a six-sided number cube (0-5)</td>
<td>Number less than 5</td>
<td>5</td>
<td>6</td>
<td>$\frac{5}{6}$</td>
</tr>
<tr>
<td>5. Toss a six-sided Number cube (0-5)</td>
<td>Odd number</td>
<td>3</td>
<td>6</td>
<td>$\frac{1}{2}$</td>
</tr>
<tr>
<td>6. Flip two coins</td>
<td>Both heads</td>
<td>1</td>
<td>4</td>
<td>$\frac{1}{4}$</td>
</tr>
<tr>
<td>7. Flip three coins</td>
<td>All heads</td>
<td>1</td>
<td>8</td>
<td>$\frac{1}{8}$</td>
</tr>
<tr>
<td>8. Pick a day of the week</td>
<td>The day contains the letter “r”</td>
<td>3</td>
<td>7</td>
<td>$\frac{3}{7}$</td>
</tr>
<tr>
<td>9. Pick a month of the year</td>
<td>The month has one syllable</td>
<td>3</td>
<td>12</td>
<td>$\frac{1}{4}$</td>
</tr>
</tbody>
</table>

10.
**Problem-Solving Investigation**

Joel went to a pumpkin patch. He saw 10 pumpkins in each row. There were 8 rows on one side of the road, and 9 rows on the other. How many pumpkins were there?

**Step 1 Understand**
Be sure you understand the problem.
What facts do you know?
- Joel went to a pumpkin patch.
- There were 10 pumpkins in each row.
- There were 8 rows on one side of the road.
- There were 9 rows on the other side of the road.

**Step 2 Plan**
Make a plan.
Choose a strategy.
You may draw a picture. Draw the road, rows, and pumpkins.
You can also make a model.

**Step 3 Solve**
Carry out your plan.
Plan 1 Draw a picture. Draw the 10 pumpkins in each of the 8 rows on one side of the road and 9 rows on the other side. Add them up.

\[
10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 = 80 \\
10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 = 90 \\
80 + 90 = 170 	ext{ pumpkins}
\]

Plan 2 Use counters to represent pumpkins.

**Step 4 Check**
Is the solution reasonable?
Reread the problem. How can you check your answer?

Solve using any strategy shown below.
- Use logical reasoning
- Make a model
- Draw a picture
- Work backward
- Make an organized list

1. Jen has 12 juice boxes in a case. She needs 96 boxes for a school picnic. How many cases will she need to bring? 8 cases

2. Marsha rides her horse 3 times a week for 2 hours at a time. How many hours does she ride her horse in 2 weeks? 3 weeks? 12 hours; 18 hours

3. Nicholas bought 4 hamburgers and 2 salads. He gave the cashier 2 ten-dollar bills. If he received $1.98 back, how much did he pay for the food? $18.02

4. Collin packed sandwiches for a field trip lunch. He had 12 turkey, 10 peanut butter, and 15 ham. Nine of the children brought their own sandwiches, so how many total children went on the field trip? 46 children

5. For your birthday, your parents bought you a bicycle for $89.49 and a new coat for $155.25. If they still have $69.98 left, how much money did they start out with? $314.72

6. Juanita made a science fair display with a spider web that spanned a 6-foot by 4-foot area. If she placed 10 spiders in each square foot, how many spiders were there? 240 spiders

7. Olivia weighs three times as much as her younger brother, Ricardo, and is seventeen years older. Ricardo is 4-years-old and weighs 2 times the amount of his sister's age. How old is Olivia? How much does each sibling weigh? The weight is in pounds.

**Ricardo weighs 42 lbs; Olivia is 21 years old and weighs 126 lbs**
Skills Practice
Problem-Solving Investigation

Solve using any strategy shown below.
• Use logical reasoning
• Make a model
• Draw a picture
• Work backward
• Make an organized list

1. Roberto has 90 vitamins in a bottle. If he takes the vitamins twice a day, how many days will the bottle last? 45 days

2. Luis rides a motor scooter to work and home every day. He has to go 40 miles one way. How many miles will he put on the motor scooter in 7 days? 10 days? 560 miles

3. Martin can choose from white socks, black socks, or colored socks, with leather shoes or tennis shoes. How many combinations of shoes and socks can he wear? 6 combinations

4. Your parents bought you a new video game system for $199.99 and $89.99 worth of games. If they still have $40.02 left, how much money did they start out with? $330

5. Rafael wants to plant 8 bushes in his yard. Each bush needs a 2 square foot area. How many square feet does he need in the yard for the bushes? 16 square feet

6. Kristen sold 60 rolls of wrapping paper. She sold 12 rolls of striped paper and 18 rolls of green paper. How many rolls were red? 30 rolls of wrapping paper were red

Homework Practice
Problem-Solving Investigation

Solve using any strategy shown below.
• Use logical reasoning
• Work backward
• Make a model
• Make an organized list
• Draw a picture

1. Sydney is a receptionist and needs to make 28 phone calls. If she can make 4 phone calls in an hour, will she be able to make all of her calls in an 8 hour day? If so, how many additional phone calls will she be able to make? yes; 4 calls

2. Wanda rides her bike to and from school 5 days a week. She rides 3/4 mile one way. How many miles will she bike in 1 week? 2 weeks? 7 1/2 miles; 15 miles

3. Nora made 4 photo albums the first year, 4 photo albums the second year, 3 photo albums the third year, and 3 photo albums the fourth year. If the pattern continues, how many photo albums will she make in the fifth and sixth years? 2 albums

4. Lola can choose from a blue sweatshirt, brown sweatshirt, or green sweatshirt, with brown boots, black boots, or tennis shoes. How many combinations can she wear? 9 combinations

5. How many possible outcomes are there? 6

6. What is the probability that you will flip a heads and spin a red or blue? 1

7. What is the probability that you will spin a red and flip a tails? 6
Play this game with a partner.

- Player A chooses a secret 4-digit number and writes it on a separate sheet of paper.
- Player B guesses a 4-digit number and writes it in the first row of the guess chart.
- Player A looks at the guess and then fills in the second chart. Player A tells the number of digits that are correct, AND how many are in the correct position. (For example, the secret number is 1093. The first guess is 6198. The number of correct digits is 2. The number of digits in the correct position is 1.)
- Based on that information, Player B makes a second guess.
- Continue playing until the secret number is guessed, or until 10 guesses have been used.
- Players then switch roles.
- After playing a couple of games compare the strategies you used for guessing with your partner.

<table>
<thead>
<tr>
<th>Guess</th>
<th>Number of Correct Numbers</th>
<th>Numbers of Digits in the Correct Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There are 12 possible outcomes.

Draw a tree diagram to show all possible outcomes. Then find the probability of the situation.

1. What is the probability of choosing a red shirt and blue shorts?

<table>
<thead>
<tr>
<th>Shirt</th>
<th>Shorts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Blue</td>
</tr>
<tr>
<td>Orange</td>
<td>White</td>
</tr>
<tr>
<td>Black</td>
<td></td>
</tr>
</tbody>
</table>

See students’ diagram.
**Skills Practice**  
Tree Diagrams

Use a tree diagram to solve.

1. You spin a spinner with 4 equal sections marked 1–4. Then you spin another spinner with 3 equal sections colored red, blue, and yellow. What are all of the possible outcomes?
   **Check students’ diagrams:** 12 possible outcomes:
   1R, 1B, 1Y, 2R, 2B, 2Y, 3R, 3B, 3Y, 4R, 4B, 4Y

2. Karen throws a dart at a target with 5 equal sections marked 1–5. She then throws a dart at a target with two equal sections colored green and blue. What are all of the possible outcomes?
   **Check students’ diagrams:** 10 possible outcomes:
   1G, 1B, 2G, 2B, 3G, 3B, 4G, 4B, 5G, 5B

3. The Boardwalk Shop sells souvenir shirts. The shirts come with long sleeves or short sleeves. The shirts come in white, gray, and blue. What are all of the different kinds of shirts?
   **Check students’ diagrams:** 6 possible outcomes: LS W, LS G, LS B, SS W, SS G, SS B

4. Boardwalk Burgers sells burgers made from beef, turkey, chicken, or soy. Burgers can have no cheese, Swiss cheese, or American cheese. How many different choices are there?
   **Check students’ diagrams:** 12 possible outcomes:
   B no C, BS, BA, T no C, TS, TA, C no C, CS, CA, S no C, SS, SA

---

**Homework Practice**  
Tree Diagrams

Draw a tree diagram.

1. What is the probability of choosing a white jacket and black shoes?

<table>
<thead>
<tr>
<th>Jacket</th>
<th>Shoes</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>Black</td>
</tr>
<tr>
<td>Black</td>
<td>Tan</td>
</tr>
<tr>
<td>Green</td>
<td>White</td>
</tr>
</tbody>
</table>

   W  B  G
   B  T  W
   W  B  T
   W  T  W
   B  B  W
   B  T  B
   W  W  BW
   W  G  GW

2. Karen throws a dart at a target with 5 equal sections marked 1–5. She then throws a dart at a target with two equal sections colored green and blue. What are all of the possible outcomes?
   **Check students’ diagrams:** 10 possible outcomes:
   1G, 1B, 2G, 2B, 3G, 3B, 4G, 4B, 5G, 5B

3. What location had the least number of people?
   **Port Aransas, TX**

4. What was the difference in the number of people at the two California locations?
   **400 people**
**Problem-Solving Practice**

**Tree Diagrams**

Make a tree diagram to solve.

1. Jared and Dimitri are playing a game with 2 spinners. How many possible combinations are there if Dimitri spins both spinners?
   - 6 possible combinations

   ![Tree Diagram](image)

2. Anna is deciding what she could wear to the zoo tomorrow. She can choose a white shirt, a green shirt, or a blue shirt. She can choose blue pants or green pants. How many different outfits can she make?
   - 6 possible outfits
   - What are they?

   ![Outfit Diagram](image)
Vocabulary Test

Match each word to its definition.
Write your answers on the lines provided.

1. probability
   A. something you think will happen such as a specific outcome of an experiment

2. outcome
   B. a diagram of all the possible outcomes of an event or series of events or experiments

3. favorable outcomes
   C. a number that represents part of a whole or part of a set

4. prediction
   D. a number between 0 and 1 that measures the likelihood of an event happening

5. tree diagram
   E. a possible result of an experiment

6. fraction
   F. desired results in a probability experiment

Oral Assessment

Place 8 nickels, 4 dimes, 2 quarters and 1 penny on a table. Tell the student the total amount of each coin, and then place the coins in a bag.

Read each question aloud to the student. Then write the student's answers on the lines below the question.

1. What is the probability of your picking a dime out of the bag?
   4 out of 15; $\frac{4}{15}$

2. What is the probability of your picking a nickel out of the bag?
   8 out of 15; $\frac{8}{15}$

3. Tell how you got your answer.
   Answers may vary.

4. What is the probability of your picking a penny out of the bag?
   1 out of 15; $\frac{1}{15}$

5. What is the probability of your picking a quarter out of the bag?
   2 out of 15; $\frac{2}{15}$

6. Explain your answer.
   Answers may vary.
7. What is the probability of spinning a 4?
   6 out of 12; 6/12 = 1/2

8. What is the probability of spinning a 3?
   2 out of 12; 2/12 = 1/6

9. Tell how you got your answer.
   Answers will vary.

10. What is the probability of spinning a 2?
    3 out of 12; 3/12 = 1/4

11. Explain your answer.
    Answers will vary.

12. What is the probability of spinning a 5?
    0 out of 12; 0/12

13. Tell how you got your answer.
    Answers will vary.
Chapter 16 Assessment Answer Key

Diagnostic Assessment
Page 39

Chapter Pretest
Page 40

Quiz 1
Page 41

1. \( \frac{4}{8} \) or \( \frac{1}{2} \)

2. \( \frac{5}{9} \)

3. \( \frac{3}{6} \) or \( \frac{1}{2} \)

4. \( \frac{1}{6} \)

5. \( \frac{5}{15} \) or \( \frac{1}{3} \)

6. Number | Results
---|---
1 | \|
2 | |
3 | \|
4 | \|
5 | |

7. Food | Tally
---|---
Chicken | \|
Fish | \|
Pasta | \|
Pizza | \|

8. \( \frac{4}{16} \) or \( \frac{1}{4} \)

9. \( \frac{16}{16} \)

10. \( \frac{7}{8} \)

11. \( \frac{1}{4} \)

12. \( \frac{0}{8} \)

13. \( \frac{7}{8} \)

14. \( \frac{1}{4} \)

15. \( \frac{0}{8} \)

16. \( \frac{7}{8} \)

17. \( \frac{1}{4} \)

18. \( \frac{0}{8} \)

19. \( \frac{7}{8} \)

20. \( \frac{1}{4} \)

21. \( \frac{0}{8} \)

22. \( \frac{7}{8} \)

23. \( \frac{1}{4} \)

24. \( \frac{0}{8} \)

25. \( \frac{7}{8} \)

26. \( \frac{1}{4} \)

27. \( \frac{0}{8} \)

28. \( \frac{7}{8} \)

29. \( \frac{1}{4} \)

30. \( \frac{0}{8} \)

31. \( \frac{7}{8} \)

32. \( \frac{1}{4} \)

33. \( \frac{0}{8} \)

34. \( \frac{7}{8} \)

35. \( \frac{1}{4} \)

36. \( \frac{0}{8} \)

37. \( \frac{7}{8} \)

38. \( \frac{1}{4} \)

39. \( \frac{0}{8} \)

40. \( \frac{7}{8} \)

41. \( \frac{1}{4} \)
Chapter 16 Assessment Answer Key

Quiz 2
Page 42

1. 24 ways
2. 12 combinations
3. 6 ways
4. 12
5. \( \frac{8}{12} \) or \( \frac{2}{3} \)
6. 0
7. \( \frac{2}{12} \) or \( \frac{1}{6} \)
8. \( \frac{3}{12} \) or \( \frac{1}{4} \)
9. \( \frac{1}{12} \)
10. \( \frac{3}{12} \) or \( \frac{1}{4} \)

Quiz 3
Page 43

1. \( \frac{1}{12} \)
2. \( \frac{2}{12} \) or \( \frac{1}{6} \)
3. \( \frac{4}{12} \) or \( \frac{1}{3} \)
4. \$155

Mid-Chapter Review
Page 44

1. unlikely
2. equally likely
3. likely
4. certain
5. \( \frac{1}{5} \); 1 out of 5;
   Since \( \frac{1}{5} \) is less than half, it is unlikely.
6. \( \frac{2}{5} \); 2 out of 5;
   Since \( \frac{2}{5} \) is less than half, it is unlikely.
7. \( \frac{3}{5} \); 3 out of 5;
   Since \( \frac{3}{5} \) is greater than half, it is likely.
8. \( \frac{2}{3} \)
9. 32 ways
10. Red and blue,
    red and yellow,
    red and green,
    blue and yellow,
    blue and green,
    yellow and green
Chapter 16 Assessment Answer Key

Form 1
Page 50

1. C
2. G
3. D
4. F
5. D
6. F
7. A
8. J
9. B
10. G
11. C
12. F

(Continued on the next page)
## Chapter 16 Assessment Answer Key

<table>
<thead>
<tr>
<th>Form 2A</th>
<th>Form 2B</th>
<th>Form 2B</th>
</tr>
</thead>
<tbody>
<tr>
<td>(continued)</td>
<td>Page 53</td>
<td>Page 54</td>
</tr>
<tr>
<td>9. <strong>B</strong></td>
<td><strong>1. B</strong></td>
<td>**8. <strong>H</strong></td>
</tr>
<tr>
<td>10. <strong>G</strong></td>
<td>**2. <strong>H</strong></td>
<td></td>
</tr>
<tr>
<td>11. <strong>D</strong></td>
<td>**3. <strong>B</strong></td>
<td>**9. <strong>B</strong></td>
</tr>
<tr>
<td>12. <strong>F</strong></td>
<td>**4. <strong>F</strong></td>
<td>**10. <strong>H</strong></td>
</tr>
<tr>
<td>13. <strong>C</strong></td>
<td>**5. <strong>A</strong></td>
<td>**11. <strong>C</strong></td>
</tr>
<tr>
<td>14. <strong>J</strong></td>
<td>**6. <strong>G</strong></td>
<td></td>
</tr>
<tr>
<td>15. <strong>D</strong></td>
<td>**7. <strong>C</strong></td>
<td></td>
</tr>
<tr>
<td>16. <strong>F</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. <strong>D</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: The answers are listed in the order of the questions.*
Chapter 16 Assessment Answer Key

Form 2C
Page 56

1. certain
2. equally likely
3. unlikely
4. impossible

5. \( \frac{2}{3} \)
6. \( \frac{1}{2} \)
7. \( \frac{1}{6} \)
8. \( \frac{1}{2} \)

9. \( 20 \)
10. \( \frac{17}{20} \)
11. \( \frac{25}{4} \) or \( \frac{1}{5} \)
12. \( \frac{20}{20} \) or \( \frac{1}{5} \)

(Continued on the next page)
Chapter 16 Assessment Answer Key

Form 2D (continued)
Page 59

11. \(\frac{4}{20}\) or \(\frac{1}{5}\)

12. 25

13. 15

14. \(\frac{1}{5}\)

15. \(\frac{0}{12}\) or 0

16. \(\frac{1}{15}\)

17. 2 nickels

18. \(\frac{11}{16}\)

19. Sonya, Isabel, Kate, Julie

Form 3
Page 60

1. **likely**

2. **likely**

3. **unlikely**

4. \(\frac{2}{9}\)

5. \(\frac{2}{3}\)

6. \(\frac{2}{9}\)

7. Check students’ drawings.

8. \(\frac{1}{3}\)

9. \(\frac{1}{3}\)

10. 16

11. 24

12. \(\frac{4}{24}\) or \(\frac{1}{6}\)

13. \(\frac{0}{24}\) or 0

14. \(\frac{4}{24}\) or \(\frac{1}{6}\)

15. All spinner numbers are even.

16. 3 pens, 4 markers, 5 crayons

Page 61
## Chapter 16 Assessment Answer Key

### Page 62, Extended-Response Test

#### Scoring Rubric

<table>
<thead>
<tr>
<th>Level</th>
<th>Specific Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>The student demonstrates a <strong>thorough understanding</strong> of the mathematics concepts and/or procedures embodied in the task. The student has responded correctly to the task, used mathematically sound procedures, and provided clear and complete explanations and interpretations. The response may contain minor flaws that do not detract from the demonstration of a thorough understanding.</td>
</tr>
<tr>
<td>3</td>
<td>The student demonstrates an <strong>understanding</strong> of the mathematics concepts and/or procedures embodied in the task. The student’s response to the task is essentially correct with the mathematical procedures used and the explanations and interpretations provided demonstrating an essential but less than thorough understanding. The response may contain minor errors that reflect inattentive execution of the mathematical procedures or indications of some misunderstanding of the underlying mathematics concepts and/or procedures.</td>
</tr>
<tr>
<td>2</td>
<td>The student has demonstrated only a <strong>partial understanding</strong> of the mathematics concepts and/or procedures embodied in the task. Although the student may have used the correct approach to obtaining a solution or may have provided a correct solution, the student’s work lacks an essential understanding of the underlying mathematical concepts. The response contains errors related to misunderstanding important aspects of the task, misuse of mathematical procedures, or faulty interpretations of results.</td>
</tr>
<tr>
<td>1</td>
<td>The student has demonstrated a <strong>very limited understanding</strong> of the mathematics concepts and/or procedures embodied in the task. The student’s response to the task is incomplete and exhibits many flaws. Although the student has addressed some of the conditions of the task, the student reached an inadequate conclusion and/or provided reasoning that was faulty or incomplete. The response exhibits many errors or may be incomplete.</td>
</tr>
<tr>
<td>0</td>
<td>The student has provided a <strong>completely incorrect</strong> solution or uninterpretable response, or no response at all.</td>
</tr>
</tbody>
</table>
Chapter 16 Assessment Answer Key

Page 62, Extended-Response Test
Sample Answers

In addition to the scoring rubric found on page A25, the following sample answers may be used as guidance in evaluating open-ended assessment items.

1. a. 

<table>
<thead>
<tr>
<th>Color of pencil</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>6</td>
</tr>
<tr>
<td>Red</td>
<td>2</td>
</tr>
<tr>
<td>Black</td>
<td>1</td>
</tr>
<tr>
<td>Green</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>10</td>
</tr>
</tbody>
</table>

b. Carl has a \(\frac{6}{10}\) or 6 out of 10 chance of pulling out a blue pencil. Since \(\frac{6}{10}\) is greater than half, he is likely to pull out a blue pencil.

c. Carl has a \(\frac{2}{10}\) or 2 out of 10 chance of pulling out a red pencil. Since \(\frac{2}{10}\) is less than half, he is unlikely to pull out a red pencil.

d. Carl has a \(\frac{10}{10}\) or 10 out of 10 chance of pulling out a pencil that isn’t brown. Since \(\frac{10}{10}\) equals one, he is certain to pull out a pencil that isn’t brown.

e. Carl has a \(\frac{1}{10}\) or 1 out of 10 chance of pulling out a pencil that is black and a \(\frac{2}{10}\) or 2 out of 10 chance of pulling out a pencil that is green, so he has a \(\frac{2}{10}\) or 2 out of 10 chance of pulling out a pencil that is either black or green. Since \(\frac{2}{10}\) is less than half, he is unlikely to pull out pencil that is either black or green. Since the probabilities of pulling out a black pencil and a green pencil are the same, he is equally likely to pull out a green pencil as a black pencil.

2. a. There is a \(\frac{3}{5}\) chance of landing on a primary color; since \(\frac{3}{5}\) is greater than half, landing on a primary color is likely.

b. There is a \(\frac{2}{5}\) chance of landing on either yellow or green; since \(\frac{2}{5}\) is less than half, landing on either yellow or green is unlikely.

c. There is a \(\frac{1}{5}\) chance of landing on a pastel color; since \(\frac{1}{5}\) is less than half, landing on a pastel color is unlikely.

d. There is a \(\frac{0}{5}\) chance of landing on the color gray; since there is no gray on the color spinner, it is impossible to land on the color gray.
### Chapter 16 Assessment Answer Key

<table>
<thead>
<tr>
<th>STP Page 64</th>
<th>Page 65</th>
<th>Page 66</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. <strong>C</strong></td>
<td>4. <strong>G</strong></td>
<td></td>
</tr>
<tr>
<td>2. <strong>H</strong></td>
<td>5. <strong>D</strong></td>
<td></td>
</tr>
<tr>
<td>3. <strong>C</strong></td>
<td>6. <strong>H</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. <strong>C</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. <strong>J</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9. <strong>A</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10. <strong>G</strong></td>
<td></td>
</tr>
</tbody>
</table>

11. \(\frac{3}{5}\); 3 out of 5; since \(\frac{3}{5}\) is greater than half, it is likely

12. \(\frac{2}{5}\); 2 out of 5; since \(\frac{2}{5}\) is less than half, it is unlikely

13. \(\frac{1}{5}\); 1 out of 5; since \(\frac{1}{5}\) is less than half, it is unlikely

14. \(\frac{0}{5}\); 0 out of 5; since there is no black on the color spinner, it is impossible

15. 12

16. \(\frac{1}{3}\)
Chapter 16 Assessment Answer Key

End-of-Year Test
Page 67

Page 68

Page 69

1. 21,004,
   20,147,
   12,740,
   12,074

2. >

3. +
   +
   +
   +
   +

4. $4,957

5. $421.64

6. 6

7. \( y = x - 9 \)

8. 20

9. 650

10. 75

11. 18 and 20

12. 7

13. 175 pages

14. 76

15. 33 yards

16. 47,346

17. 30,465

18. 376 miles

19. $228,722

20. 1,440 minutes

21. 196 R3

22. 1,504

Sample answer:

23. 30 students

24. isosceles

25. and acute

radius

26. 5

27. 26 cm

28. 13 in.

29. (4, 7)

(Continued on the next page)
30. 12

31. 3

32. \[\frac{7}{12}, \frac{5}{9}, \frac{11}{27}\]

33. \[\frac{3}{4}\]

34. Michael, Bonnie, Malan, Nina

35. 0.06

36. 10 miles

37. 35.27

38. unlikely

39. \[\frac{1}{2}\]