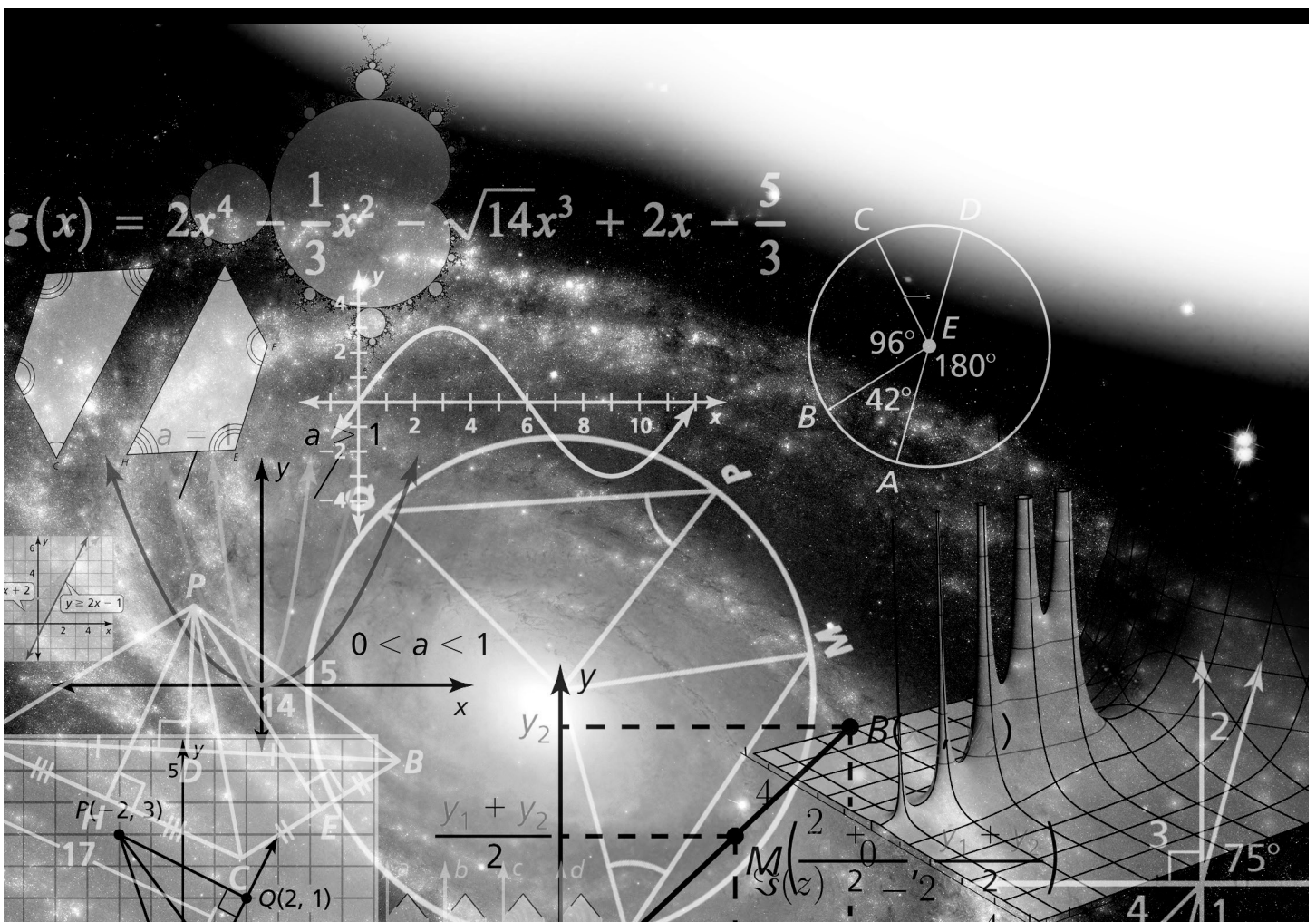


# CHAPTER 4

## Probability

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**Chapter  
4****Maintaining Mathematical Proficiency**

Write and solve a proportion to answer the question.

1. What percent of 260 is 65?
2. What number is 32% of 75?
3. 15.01 is what percent of 19?

Display the data in a histogram.

4.

	Number of Strike-outs in One Game		
Strike-outs	0–3	4–7	8–11
Frequency	34	20	8

5.

	Number of Days of Exercise in One Week			
Days of Exercise	0–1	2–3	4–5	6–7
Frequency	4	26	22	6

# 4.1

## Sample Spaces and Probability

For use with Exploration 4.1

**Essential Question** How can you list the possible outcomes in the sample space of an experiment?

The **sample space** of an experiment is the set of all possible outcomes for that experiment.

### 1 EXPLORATION: Finding the Sample Space of an Experiment

**Work with a partner.** In an experiment, three coins are flipped. List the possible outcomes in the sample space of the experiment.



### 2 EXPLORATION: Finding the Sample Space of an Experiment

**Work with a partner.** List the possible outcomes in the sample space of the experiment.

a. One six-sided die is rolled.



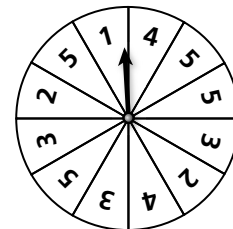
b. Two six-sided dice are rolled.



### 3 EXPLORATION: Finding the Sample Space of an Experiment

**Work with a partner.** In an experiment, a spinner is spun.

a. How many ways can you spin a 1? 2? 3? 4? 5?

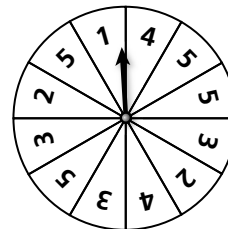


**4.1 Sample Spaces and Probability (continued)**

**3 EXPLORATION: Finding the Sample Space of an Experiment (continued)**

b. List the sample space.

c. What is the total number of outcomes?



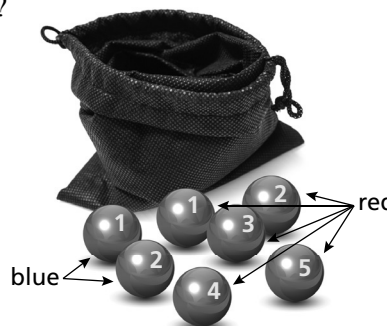
**4 EXPLORATION: Finding the Sample Space of an Experiment**

**Work with a partner.** In an experiment, a bag contains 2 blue marbles and 5 red marbles. Two marbles are drawn from the bag.

a. How many ways can you choose two blue? a red then blue? a blue then red? two red?

b. List the sample space.

c. What is the total number of outcomes?



**Communicate Your Answer**

5. How can you list the possible outcomes in the sample space of an experiment?
  
6. For Exploration 3, find the ratio of the number of each possible outcome to the total number of outcomes. Then find the sum of these ratios. Repeat for Exploration 4. What do you observe?

# 4.1

## Practice

For use after Lesson 4.1

### Core Concepts

#### Probability of the Complement of an Event

The probability of the complement of event  $A$  is

$$P(\overline{A}) = 1 - P(A).$$

Notes:

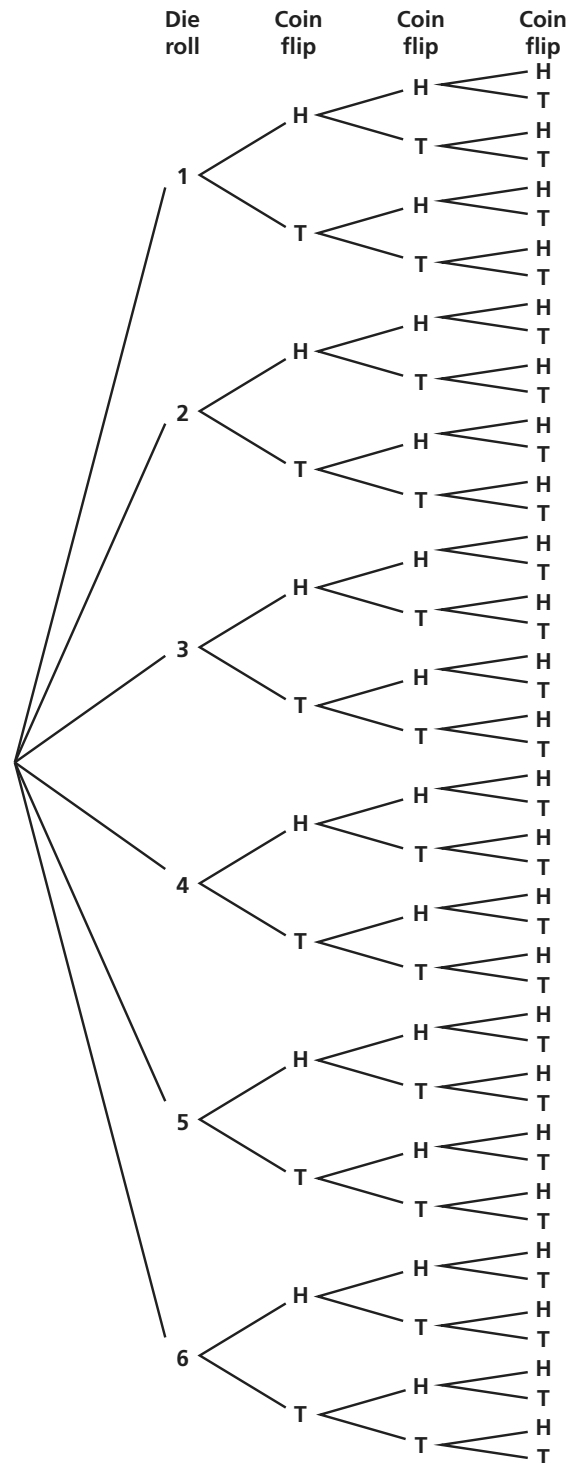
### Worked-Out Examples

#### Example #1

Find the number of possible outcomes in the sample space. Then list the possible outcomes.

Your roll a die and flip three coins.

Use a tree diagram to find the outcomes in the sample space.



The sample space has 48 possible outcomes. They are listed below.

- |      |      |      |      |      |      |
|------|------|------|------|------|------|
| 1HHH | 2HHH | 3HHH | 4HHH | 5HHH | 6HHH |
| 1HHT | 2HHT | 3HHT | 4HHT | 5HHT | 6HHT |
| 1HTH | 2HTH | 3HTH | 4HTH | 5HTH | 6HTH |
| 1THH | 2THH | 3THH | 4THH | 5THH | 6THH |
| 1HTT | 2HTT | 3HTT | 4HTT | 5HTT | 6HTT |
| 1THT | 2THT | 3THT | 4THT | 5THT | 6THT |
| 1TTH | 2TTH | 3TTH | 4TTH | 5TTH | 6TTH |
| 1TTT | 2TTT | 3TTT | 4TTT | 5TTT | 6TTT |

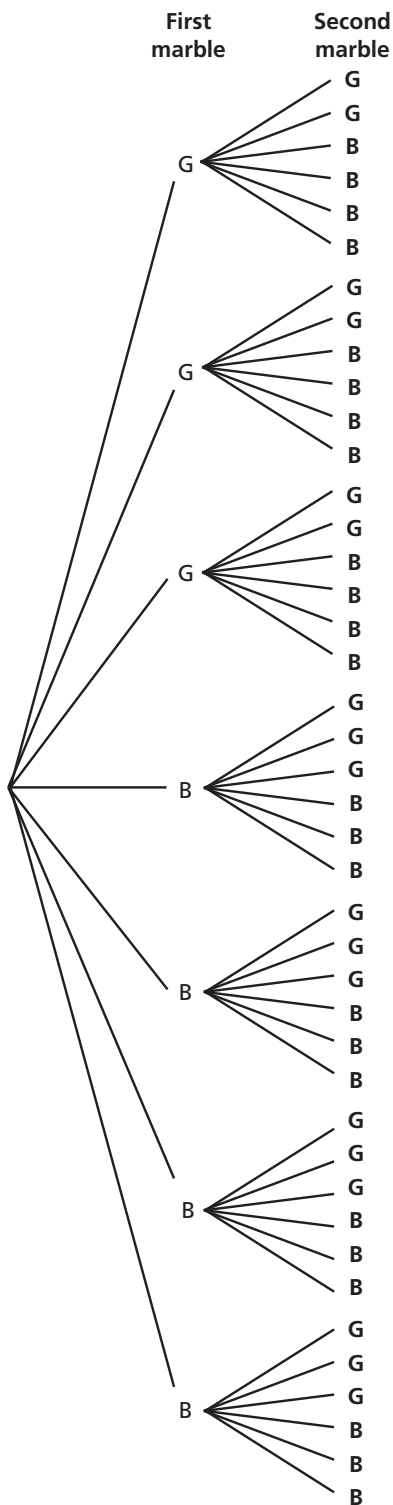
**4.1 Practice (continued)**

**Example #2**

Find the number of possible outcomes in the sample space. Then list the possible outcomes.

You draw two marbles without replacement from a bag containing three green marbles and four black marbles.

Use a tree diagram to find the outcomes in the sample space.



The sample space has 42 possible outcomes. They are:  
 GG, GG, GG, GG, GG, GG, GB, GB, GB, GB, GB, GB,  
 GB, GB, GB, GB, GB, GB, BG, BG, BG, BG, BG, BG, BG,  
 BG, BG, BG, BG, BG, BB, BB, BB, BB, BB, BB, BB,  
 BB, BB, BB, BB.

**4.1 Practice (continued)****Practice A**

In Exercises 1 and 2, find the number of possible outcomes in the sample space. Then list the possible outcomes.

1. A stack of cards contains the thirteen clubs from a standard deck of cards. You pick a card from the stack and flip two coins.
2. You spin a spinner with the numbers 1–5 on it and roll a die.
3. When two tiles with numbers between 1 and 10 are chosen from two different bags, there are 100 possible outcomes. Find the probability that (a) the sum of the two numbers is not 10 and (b) the product of the numbers is greater than 10.
4. At a school dance, the parents sell pizza slices. The table shows the number of pizza slices that are available. A student chooses a slice at random. What is the probability that the student chooses a thin crust slice with pepperoni?

	Pepperoni	Plain Cheese
Thin Crust	34	36
Thick Crust	8	12

5. Find the probability that the polynomial  $x^2 - x - c$  can be factored if  $c$  is a randomly chosen integer from 1 to 12.
6. The sections of a spinner are numbered 1 through 12. Each section of the spinner has the same area. You spin the spinner 180 times. The table shows the results. For which number is the experimental probability of stopping on the number the same as the theoretical probability?

Spinner Results											
1	2	3	4	5	6	7	8	9	10	11	12
13	21	22	20	11	8	14	9	15	12	18	17

**4.1 Practice (continued)**

7. Use the spinner in Exercise 6 to find the given odds.
  - a. in favor of stopping on a number greater than 8
  - b. against stopping on a number that is a multiple of 3

**Practice B**

**In Exercises 1 and 2, find the number of possible outcomes in the sample space. Then list the possible outcomes.**

1. You roll a die and draw a token at random from a bag containing three pink tokens and one red token.
2. You draw 3 marbles without replacement from a bag containing two brown marbles and three yellow marbles.
3. When two six-sided dice are rolled, there are 36 possible outcomes.
  - a. Find the probability that the sum is 5.
  - b. Find the probability that the sum is not 5.
  - c. Find the probability that the sum is less than or equal to 5.
  - d. Find the probability that the sum is less than 5.
4. The odds of winning a lottery game are 1:9. The probability of winning a scratch off game is 10%. For which game do you have a better chance of winning? Explain.

**In Exercises 5–7, tell whether the statement is *always*, *sometimes*, or *never* true. Explain your reasoning.**

5. If there are exactly five possible outcomes and all outcomes are equally likely, then the theoretical probability of any of the five outcomes occurring is 0.20.
6. The experimental probability of an event occurring is equal to the theoretical probability of an event occurring.
7. The probability of an event added to the probability of the complement of the event is equal to 1.
8. A manufacturer tests 900 dishwashers and finds that 24 of them are defective. Find the probability that a dishwasher chosen at random has a defect. An apartment building orders 40 of the dishwashers. Predict the number of dishwashers in the apartment with defects.