Lesson 1

Possible Outcomes

Objective Find all possible outcomes of a multistep experiment.

Vocabulary
- sample space
- fundamental counting principle

Learn About It

Jerome and Tanya make up a game in which they first toss a number cube, labeled with the numbers 1, 1, 3, 3, 5, and 5, and then flip a coin. What are the possible outcomes of tossing a number cube and then flipping a coin?

A listing of all possible outcomes is called a **sample space**. There are different ways to find the sample space for this game.

Different Ways to Find Possible Outcomes

Way 1 You can make a list.

For each number tossed, list heads and tails.

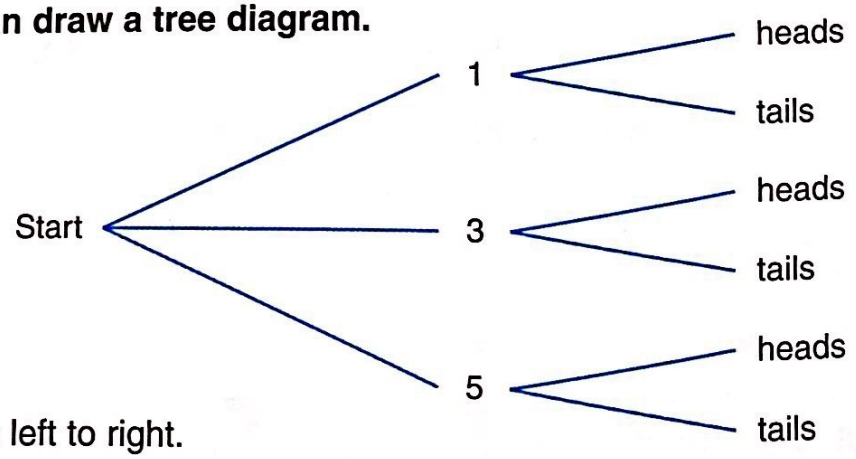
Number tossed,	Coin flipped
1,	heads
1,	tails
3,	heads
3,	tails
5,	heads
5,	tails

Way 2 You can use a grid.

Write each different pair of outcomes.

	heads	tails
1	1, heads	1, tails
3	3, heads	3, tails
5	5, heads	5, tails

Way 3 You can draw a tree diagram.



Trace each path from left to right.

use the **fundamental counting principle**.

> If an experiment or problem has two steps, with m different ways to do the first step and n different ways to do the second step, the total number of possible outcomes for the two-step sequence is $m \times n$.

In the previous example, there are 3 different outcomes (1, 3, or 5) when tossing the number cube ($m = 3$) and 2 different outcomes (heads, tails) when flipping the coin ($n = 2$).

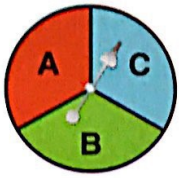
Total number of possible outcomes $= m \times n$
$= 3 \times 2$
$= 6$

Guided Practice

Make a list, a grid, and a tree diagram to show all possible outcomes.

Ask Yourself
- Did I include all possibilities?
- Did I duplicate anything?

1. Toss a number cube with numbers 1-6, then spin this spinner.



2. Flip a coin, then pick a card.

Use the fundamental counting principle to find the number of possible choices when you choose one item from each category.

3. 6 shirts, 3 pairs of shorts, 4 hats

4. 3 sizes, 4 colors

5. 3 soups, 4 main dishes, 4 desserts

6. 5 flowerpots, 8 kinds of plants

Explain Your Thinking What advantages are there for each of the three methods used for finding all possible outcomes?

Practice and Problem Solving

Make a list, a grid, and a tree diagram to show all possible outcomes.

7. Pick a card and toss a 1–6 number cube.

8. Spin the spinner and then flip a penny.

Go On

Use the fundamental counting principle to find the number of possible choices when you choose one item from each category.

9. 3 salads, 7 dressings

10. 4 pastas, 5 sauces

11. 3 cars, 5 colors, 4 options

12. 6 shirts, 5 ties, 3 jackets

13. 10 ice cream flavors, 5 toppings, 4 syrups, 3 portion sizes

Solve.

14. In Nigeria, people played the game Igba-Ita (which means to pitch and toss). In the game, players tossed 4 shells. Shells could land opening up or opening down. How many possible outcomes of tossing 4 shells are there?

15. In Igba-Ita, players won shells if all 4 shells landed up or landed down, or if 2 landed up and 2 landed down. How many winning outcomes are there?

16. **Explain** Elisa and Hector each toss two 1–6 number cubes and find the product of the two numbers. If the product is even, the player scores 1 point. If the product is odd, the player scores 3 points. Find all possible outcomes in this game. How many are even numbers? odd numbers?

17. **Write About It** Write a paragraph that explains why using the fundamental counting principle works. Include one example, using both a number cube and a spinner.

In some parts of Africa, people once used small shells called cowries as money. They also used them to play games.

Mixed Review and Test Prep

Open Response

Multiply. (Ch. 6 Lessons 2–3)

18. $\frac{5}{8} \times 1\frac{1}{2}$

19. $\frac{7}{10} \times 2\frac{4}{7}$

20. $9\frac{9}{10} \times 1\frac{2}{3}$

21. $\frac{8}{11} \times 10\frac{3}{4}$

22. $3\frac{5}{9} \times 1\frac{1}{8}$

23. $1\frac{7}{20} \times 3\frac{2}{3}$

Multiple Choice

24. Deli customers have a choice of 6 fillings, 5 types of bread, and 4 toppings. How many different sandwiches, consisting of 1 filling, 1 bread type, and 1 topping are there? (Ch. 19, Lesson 1)

A 15 **B** 30 **C** 24 **D** 120

Name _____ Date _____

Possible Outcomes

Practice 19.1

Make a list, a grid, and a tree diagram to show all possible outcomes.

1. Toss a 1–6 number cube, then toss a penny.

2. Toss a penny, then toss a nickel.

Use the fundamental counting principle to find the number of possible choices when you choose one item from each category.

3. 4 meats, 3 breads

4. 3 car models, 5 colors, 6 features

5. 3 movies, 4 CDs

6. 3 pairs of slacks, 4 shirts, 4 hats

7. 3 soups, 4 sandwiches, 6 desserts

8. 4 styles of houses, 2 styles of garages, 3 styles of fences

9. 4 comedies, 3 dramas, 5 sports events

10. 6 plays, 3 operas, 4 ballets

Test Prep

11. How many outcomes are possible when you toss a quarter, a dime, and a nickel?

A 1

B 3

C 6

D 8

12. You toss two 1–6 number cubes. How many outcomes are possible? How do you know?

Use with text pages 486–488.

Name _____ Date _____

possible Outcomes

Homework 19.1

Different Ways to Find Possible Outcomes

You can:

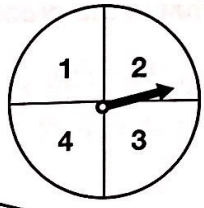
- Make a list.
- Use a grid.
- Draw a tree diagram.

Then ask yourself:

- Did I include all the possibilities?
- Did I duplicate anything?

Make a list, a grid, and a tree diagram to show all possible outcomes.

1. Spin the spinner and then toss a 1–6 number cube.



Use the fundamental counting principle to find the number of possible choices when you choose one item from each category.

2. 2 classes, 3 teachers

_____

3. 3 computers, 4 printers

_____

4. 4 sandwiches, 3 drinks, 2 desserts

_____

5. 3 bikes, 3 colors, 4 helmets

_____

Problem Solving

Show Your Work

6. Shauna has five shirts, three skirts, and four pairs of shoes. How many different outfits can Shauna wear?

_____

Use with text pages 486–488.