

MODULE 1 SECTION 3**STUDY GUIDE****Likely or Unlikely Probability****GOAL**

- LEARN HOW TO:**
- list the outcomes for an event
 - find and compare experimental probabilities
 - find theoretical probabilities

- AS YOU:**
- analyze a game
 - explore outcomes when rolling one or more number cubes

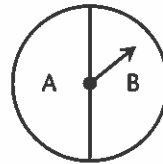
Exploration 1: What Are the Chances?**Probability and Experimental Probability**

A **probability** is a number from 0 through 1 that tells how likely it is that an event will happen. An **event** is any set of one or more outcomes. An **impossible event** has a probability of 0. A **certain event** has a probability of 1.

When you roll a number cube or spin a spinner and record the outcome, you are conducting an **experiment**. An **outcome** is the result of an experiment.

When a probability is found by repeating an experiment and recording the results, the probability is called an **experimental probability**. The experimental probability is the ratio of the number of times an event occurred to the number of times the experiment was conducted.

Spinning the spinner below is an *experiment*. There are two possible *outcomes*: A or B.



Suppose the spinner was spun 8 times and "B" resulted 3 times. The experimental probability would be $= \frac{3}{8}$.

Example

A pair of number cubes was rolled 32 times and the sum was recorded. The results of this experiment are shown in the frequency table at the right. Use the frequency table to determine the experimental probability of rolling a sum of 5.

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

MODULE 1 SECTION 3**STUDY GUIDE****Sample Response**

Since a sum of 5 occurred in 6 of the 32 rolls, the experimental probability of a sum of 5 is $\frac{6}{32}$, or $\frac{3}{16}$. This can also be written as $P(\text{sum of 5}) = \frac{3}{16}$.

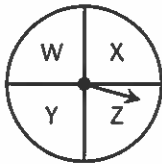
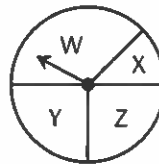
Exploration 2: Theoretical Probability

A **theoretical probability** is a probability that is determined without actually doing an experiment.

When two or more outcomes have the same chance of occurring, the outcomes are **equally likely**.

Example

Tell whether the outcomes W, X, Y, and Z on each spinner below are equally likely to occur. Then find the theoretical probability of spinning an X.

a.**b.****Sample Response**

- a.** Since the spinner is divided into four equal-sized sectors, the four outcomes (W, X, Y, and Z) are equally likely to occur.

Since the four sectors of the spinner are the same size, the theoretical probability is

$$P(X) = \frac{1}{4}$$

- b.** Since the spinner is not divided into four equal-sized sectors, the four outcomes (W, X, Y, and Z) are not equally likely to occur.

The sector labeled "X" appears to be approximately one-eighth of the whole spinner, so the theoretical probability of spinning X is

$$P(X) = \frac{1}{8}$$