

# 14-5 Probability Simulations (Pages 782–788)

The type of probability that you have used so far is **theoretical probability**, which is calculated by dividing the number of favorable outcomes by the number of total possible outcomes. Probability can also apply to the actual data that is collected by conducting an experiment. This type of probability is called **experimental probability**. Experimental probability is a ratio that compares the **relative frequency**, or the number of times a favorable outcome occurred, with the total number of times the experiment was conducted. Performing an experiment many times, recording data, and analyzing results is called an **empirical study**. When conducting an empirical study with an event that may be unrealistic to perform, you can use a **simulation**, or similar experiment with the same probability as the desired experiment.

<b>Calculating Theoretical Probability</b>	$P(\text{event}) = \frac{\text{the number of favorable outcomes}}{\text{the number of possible outcomes}}$
<b>Calculating Experimental Probability</b>	$P(\text{event}) = \frac{\text{the relative frequency of favorable events}}{\text{total number of events}}$

### Examples

A Number Cube is Rolled 20 Times	
Number Rolled	Frequency
1	2
2	5
3	3
4	8
5	1
6	1

**a. What is the theoretical probability of rolling a 6 on a number cube?**

$$P(6) = \frac{1}{6}$$

$$P(6) = 16.\bar{6}\%$$

**b. According to the data, what is the experimental probability of rolling a 6 on a number cube?**

$$P(6) = \frac{1}{20}$$

$$P(6) = 5\%$$

### Practice

**A card is drawn from a standard deck of 52 playing cards. This process is repeated a total of 100 times. The results have been recorded in the table. Use this information for Exercises 1–3.**

Clubs	22
Diamonds	17
Hearts	31
Spades	30

- What is the experimental probability of drawing a club?
- What is the experimental probability of drawing a diamond or a spade?
- Standardized Test Practice** What is the theoretical and experimental probability of drawing a heart or a club?  
**A** 50%, 53%      **B** 25%, 31%      **C** 25%, 22%      **D** 50%, 48%