6.7 Probability and Odds

Goal: Find probabilities.

Vocabulary

Outcomes: The possible results of an experiment are outcomes.

Event: An event is an outcome or a collection of outcomes.

Favorable outcomes: The outcomes for a specified event are called favorable outcomes.

Probability: The probability that an event occurs is a measure of how likely it is that the event will occur.

Theoretical probability: Theoretical probability is based on knowing all of the equally likely outcomes of an experiment.

Experimental probability: A probability that is based on repeated trials of an experiment is called an experimental probability. Each trial in which the event happens or does not happen is called a success.

Odds in favor: The ratio of the number of favorable outcomes to the number of unfavorable outcomes is called the odds in favor of an event.

Odds against: The ratio of the number of unfavorable outcomes to the number of favorable outcomes is called the odds against an event.

Probability of an Event

The probability of an event when all outcomes are equally likely is:

$$P(\text{event}) = \frac{\text{Number of favorable outcomes}}{\text{Number of possible outcomes}}$$

Example 1 *Finding a Probability*

Suppose you roll a number cube. What is the probability that you roll an odd number?

6 sides

Solution

Rolls of 1, 3, 5 are odd, so there are 3 favorable outcomes.

There are 6 possible outcomes.

$$P(\text{rolling an odd \#}) = \frac{\text{\# of favorable outcomes}}{\text{possible outcomes}} = \frac{3}{6} = \frac{1}{2}$$

Checkpoint

1. Suppose you roll a number cube. What is the probability that you roll a number less than 5?

$$P(\# < 5) = \frac{4}{6} \div 2 = \frac{2}{3}$$

2. Suppose you roll a number cube. What is the probability that you roll a number that is a multiple of 3?

$$P(\text{multiple of } 3) = \frac{2}{6} = \frac{1}{3}$$

Experimental Probability

The experimental probability of an event is:

$$P(\text{event}) = \frac{\text{Number of successes}}{\text{Number of trials}}$$

Example 2 ***Finding Experimental Probability***

You plant 32 seeds of a certain flower and 18 of them sprout. Find the experimental probability that the next flower seed planted will sprout.

Solution

$P(\text{flower seed will sprout}) = \frac{\square}{\square}$ ← Number of successes / ← Number of trials

$= \square$ Simplify.

Answer: The experimental probability that a flower seed will sprout is $\square$, or $\square$.

Example 3 ***Finding the Odds***

Suppose you randomly choose a number between 1 and 16.

a. What are the odds in favor of choosing a prime number?

b. What are the odds against choosing a prime number?

Solution

a. There are $\square$ favorable outcomes ($\square$) and $16 - \square = \square$ unfavorable outcomes.

$$\text{Odds in favor} = \frac{\text{Number of favorable outcomes}}{\text{Number of unfavorable outcomes}} = \frac{\square}{\square} = \square$$

The odds are $\square$, or $\square$ to $\square$, that you choose a prime number.

b. The odds against choose a prime number are $\square$, or $\square$ to $\square$.