6.7 Probability and Odds

Goal: Find probabilities.

Vocabulary

Outcomes:

Event:

Favorable outcomes:

Probability:

Theoretical probability:

Experimental probability:

Odds in favor:

Odds against:

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

$P(\text{flower seed will sprout}) = \frac{18}{32} \div 2$ — Number of successes / Number of trials

$= \frac{9}{16}$ Simplify.

Answer: The experimental probability that a flower seed will sprout is $\frac{9}{16}$, or 56%.

0.5625

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 6 favorable outcomes (2, 3, 5, 7, 11, 13) and $16 - 6 = 10$ unfavorable outcomes.

$$\text{Odds in favor} = \frac{\text{Number of favorable outcomes}}{\text{Number of unfavorable outcomes}} = 6:10 = 3:5$$

The odds are , or 3 to 5, that you choose a prime number.

b. The odds against choose a prime number are 5:3, or 5 to 3.