

Lesson 12-9

Example 1 Probability of Independent Events

GAMES Find the probability of getting four tails in a row when a coin is tossed four times.

The events are independent since each flip of the coin does not affect the outcome of the next flip. There are two possible outcomes each time the coin is tossed. So, the probability of tossing a tail is $\frac{1}{2}$.

$$\begin{aligned} P(\text{four tails}) &= P(\text{tail on 1}^{\text{st}} \text{ flip}) \cdot P(\text{tail on 2}^{\text{nd}} \text{ flip}) \cdot P(\text{tail on 3}^{\text{rd}} \text{ flip}) \cdot P(\text{tail on 4}^{\text{th}} \text{ flip}) \\ &= \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \\ &= \frac{1}{16} \end{aligned}$$

The probability of tossing four tails is $\frac{1}{16}$.

Example 2 Probability of Dependent Events

Benjamin takes two marbles from a bag containing 2 red marbles, 4 blue marbles, and 3 yellow marbles. What is the probability that both of the marbles he takes are yellow?

$$\begin{aligned} P(\text{two yellow marbles}) &= P(\text{yellow marble on first try}) \cdot P(\text{yellow marble on second try}) \\ &= \frac{3}{9} \cdot \frac{2}{8} \\ &= \frac{6}{72} \text{ or } \frac{1}{12} \end{aligned}$$

Example 3 Probability of Mutually Exclusive Events

A number cube is rolled once. What is the probability of getting a number less than 2 or a number divisible by 3?

The events are mutually exclusive because a number on the number cube cannot be less than 2 and divisible by 3 at the same time.

$$\begin{aligned} P(\text{less than 2 or divisible by 3}) &= P(\text{less than 2}) + P(\text{divisible by 3}) \\ &= \frac{1}{6} + \frac{2}{6} \\ &= \frac{3}{6} \text{ or } \frac{1}{2} \end{aligned}$$

The probability of getting a number less than 2 or a number divisible by 3 is $\frac{1}{2}$.