# Lesson 15.5:

# Independent and Dependent Events

## Essential Question

What is the difference between dependent and independent events?

Dependent events affect each other.

Independent events do not.

**Tell whether the events are *independent* or *dependent*. Explain.**

**1.** You roll a number cube twice. The first roll is a 3 and the second roll is an odd number.

Independent

**2.** You flip a coin twice. The first flip is heads and the second flip is tails.

Independent

**3.** You randomly draw a marble from a bag containing 3 red marbles and 5 blue marbles. You keep the marble and then draw a second marble.

Dependent

**4.** You randomly draw a marble from a bag containing 6 red marbles and 2 blue marbles. You put the marble back and then draw a second marble.

Independant

## Key Idea

**Probability of Independent Events**

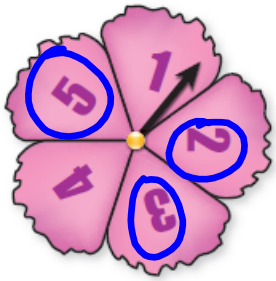
**Words** The probability of two or more independent events is the product of the probabilities of the events.

**Symbols** $P(A \text{ and } B) = P(A) \cdot P(B)$

$P(A \text{ and } B \text{ and } C) = P(A) \cdot P(B) \cdot P(C)$

(Just like 15.4)

**You spin the spinner and flip the coin. What is the probability of spinning a prime number and flipping tails?**




$\frac{3}{5}$

$\frac{1}{2}$

$\frac{3}{5} \cdot \frac{1}{2} = \frac{3}{10}$ or 30%

**What is the probability of spinning a multiple of 2 and flipping heads?**


$\frac{2}{5}$

$\frac{1}{2}$

$\frac{2}{5} \cdot \frac{1}{2} = \frac{1}{5}$ or 20%

## Key Idea

**Probability of Dependent Events**

**Words** The probability of two dependent events $A$ and $B$ is the probability of $A$ times the probability of $B$ after $A$ occurs.

**Symbols** $P(A \text{ and } B) = P(A) \cdot P(B \text{ after } A)$

↑ Look at as a totally different event

**People are randomly chosen to be game show contestants from an audience of 100 people. You are with 5 of your relatives and 6 other friends. What is the probability that one of your relatives is chosen first, and then one of your friends is chosen second?**

$P(\text{relative } 1^{st}) \cdot P(\text{friend } 2^{nd})$

$\frac{5}{100} \cdot \frac{6}{99} = \frac{1}{20} \cdot \frac{2}{33} = \frac{1}{10} \quad \frac{1}{33}$

Someone has already been chosen

$= \boxed{\frac{1}{130}}$

**What is the probability that you, your relatives, and your friends are *not* chosen to be either of the first two contestants?**

1 5 6

$1 + 5 + 6 = 12$ $100 - 12 = 88$

$P(\text{not } 1^{st}) \cdot P(\text{not } 2^{nd})$

$\frac{88}{100} \cdot \frac{87}{99}$ ← one person not in your group has already been chosen

$\frac{88 \div 4}{100 \div 4} \cdot \frac{87 \div 3}{99 \div 3} = \frac{22 \div 11}{25} \cdot \frac{29}{33 \div 11} = \frac{2 \cdot 29}{25 \cdot 3} = \boxed{\frac{58}{75} \text{ or } 77\%}$

**A student randomly guesses the answer for each of the multiple-choice questions. What is the probability of answering all three questions correctly?**

1/5 1/5 1/5

1. In what year did the United States gain independence from Britain?
   A. 1492 B. 1776 C. 1788 D. 1795 E. 2000
2. Which amendment to the Constitution grants citizenship to all persons born in the United States and guarantees them equal protection under the law?
   A. 1st B. 5th C. 12th D. 13th E. 14th
3. In what year did the Boston Tea Party occur?
   A. 1607 B. 1773 C. 1776 D. 1780 E. 1812

$P(\#1 \checkmark) \cdot P(\#2 \checkmark) \cdot P(\#3 \checkmark)$

$\frac{1}{5} \cdot \frac{1}{5} \cdot \frac{1}{5} = \boxed{\frac{1}{125} \text{ or } 0.8\%}$

**The student can eliminate Choice A for all three questions. What is the probability of answering all three questions correctly? Compare this probability with the probability in Example 3. What do you notice?**

$\frac{1}{4} \cdot \frac{1}{4} \cdot \frac{1}{4} = \boxed{\frac{1}{64}}$ or 1.6%

Chances are about doubled!

~0.8% vs. ~1.6%

**You and your friend are among 5 volunteers to help distribute workbooks. What is the probability that your teacher randomly selects you and your friend to distribute the workbooks?**

P(one of you 1st) · P(other one 2nd)

$\frac{2}{5} \cdot \frac{1}{4}$ ← Assuming one of you has been selected

$\frac{2}{20} = \boxed{\frac{1}{10} \text{ or } 10\%}$