

Name: _____

Date: _____

10.2 Independent and Dependent Events

SWBAT determine whether two events are independent or dependent and find the probabilities of independent and dependent events.

- When the occurrence of one event does not affect the occurrence of the other event, the two events are _____
 - $P(A \text{ and } B) = P(A) \cdot P(B)$
 - $P(B|A) = P(B)$
 - $P(A|B) = P(A)$
- When the occurrence of one event does affect the occurrence of the other event, the two events are _____
 - $P(A \text{ and } B) = P(B|A) \cdot P(A)$
- The probability that event B occurs given that event A has occurred is called the _____ of B given A and is written as $P(B|A)$.
 - $P(B|A) = \frac{P(A \text{ and } B)}{P(A)}$

Practice

- (1) A group of four students includes one boy and three girls. The teacher randomly selects one of the students to be the speaker and a different student to be the recorder. Determine whether randomly selecting a girl first and randomly selecting a girl second are independent events.
- (2) You roll a six-sided die and flip a coin. Event A: You get a 4 when rolling the die. Event B: You get tails when flipping the coin. Determine whether events A and B are independent or dependent events.
- (3) As part of a board game, you need to spin the spinner, which is divided into equal parts. Find the probability that you get a 5 of the first spin and a number greater than 3 on your second spin.



- (4) Events A and B are independent. Describe and correct the error in finding $P(A \text{ and } B)$.

$P(A) = 0.6$

$P(B) = 0.2$

$P(A \text{ and } B) = 0.6 + 0.2 = 0.8$

(5) Events A and B are independent. Suppose $P(B) = 0.4$ and $P(A \text{ and } B) = 0.13$. Find $P(A)$.

(6) At a school, 60% of students buy a school lunch. Only 10% of students buy lunch and dessert. What is the probability that a student who buys lunch also buys dessert?

(7) At a school, 43% of students attend the homecoming football game. Only 23% of students go to the game and homecoming dance. What is the probability that a student who attends the football game also attends the dance?

(8) Events A and B are dependent. Suppose $P(B|A) = 0.6$ and $P(A \text{ and } B) = 0.15$. Find $P(A)$.

(9) At a gas station, 84% of customers buy gasoline. Only 5% of customers buy gasoline and a beverage. What is the probability that a customer who buys gasoline also buys a beverage?

(10) The table shows the number of species in the United States listed as endangered and threatened. Find (a) the probability that a randomly selected endangered species is a bird, and (b) the probability that a randomly selected mammal is endangered.

	Endangered	Threatened
Mammals	70	16
Birds	80	16
Other	318	142

(11) A bag contains 9 red marbles, 4 blue marbles, and 7 yellow marbles. You randomly select three marbles from the bag. What is the probability that all three marbles are red when (a) you replace each marble before selecting the next marble, and (b) you do not replace each marble before selecting the next marble? Compare the probabilities.

(12) A meteorologist claims that there is a 70% chance of rain. When it rains, there is a 75% chance that your softball game will be rescheduled. Your friend believed the game is more likely to be rescheduled than played. Is your friend correct? Explain your reasoning.

Name: Answer Key

Date: _____

10.2 Independent and Dependent Events

SWBAT determine whether two events are independent or dependent and find the probabilities of independent and dependent events.

- When the occurrence of one event does not affect the occurrence of the other event, the two events are independent.
 - $P(A \text{ and } B) = P(A) \cdot P(B)$
- When the occurrence of one event does affect the occurrence of the other event, the two events are dependent.
 - $P(A \text{ and } B) = P(B|A)$
- The probability that event B occurs given that event A has occurred is called the Conditional probability of B given A and is written as $P(B|A)$.
 - $P(B|A) = \frac{P(A \text{ and } B)}{P(A)}$

Practice

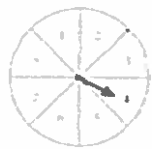
- (1) A group of four students includes one boy and three girls. The teacher randomly selects one of the students to be the speaker and a different student to be the recorder. Determine whether randomly selecting a girl first and randomly selecting a girl second are independent events.

$$P(\text{girl first}) = \frac{3}{4} = \frac{3}{4} \quad P(\text{girl second}) = \frac{3}{3} = \frac{3}{3}$$
$$P(A \text{ and } B) = \frac{6}{12} = \frac{1}{2} \quad \frac{3}{4} \cdot \frac{3}{3} \neq \frac{1}{2} \quad \text{dependent}$$

- (2) You roll a six-sided die and flip a coin. Event A: You get a 4 when rolling the die. Event B: You get tails when flipping the coin.

Dependent because flipping a coin does not affect rolling a die.

- (3) As part of a board game, you need to spin the spinner, which is divided into equal parts. Find the probability that you get a 5 on the first spin and a number greater than 3 on your second spin.



A = 5 on spin
B = greater than 3 spin
Independent

$$P(A) = \frac{1}{8} \quad P(A \text{ and } B) = P(A) \cdot P(B)$$
$$P(B) = \frac{5}{8}$$

$$= \frac{1}{8} \cdot \frac{5}{8}$$
$$= \frac{5}{64} \approx \boxed{7.8\%}$$

- (4) Events A and B are independent. Describe and correct the error in finding $P(A \text{ and } B)$.

$$P(A) = 0.6$$

$$P(B) = 0.2$$

$$P(A \text{ and } B) = 0.6 + 0.2 = 0.8$$

The probabilities were added instead of multiplied;

$$P(A \text{ and } B) = (.6)(.2) = .12$$

(5) Events A and B are independent. Suppose $P(B) = 0.4$ and $P(A \text{ and } B) = 0.13$. Find $P(A)$.

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

$$\frac{.13}{.4} = \frac{P(A) \cdot .4}{.4}$$

$$P(A) = 0.325$$

(6) At a school, 60% of students buy a school lunch. Only 10% of students buy lunch and dessert. What is the probability that a student who buys lunch also buys dessert?

A = buy lunch
B = buy dessert

$$P(B|A) = \frac{P(A \text{ and } B)}{P(A)}$$

$$= \frac{.1}{.6}$$

$$= \frac{1}{6} \approx 0.167$$

16.7%

(7) At a school, 43% of students attend the homecoming football game. Only 23% of students go to the game and homecoming dance. What is the probability that a student who attends the football game also attends the dance?

Football = A
Dance = B

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

$$\frac{.23}{.43} = \frac{.43 \cdot P(B)}{.43}$$

$$0.5348 = P(B)$$

53.5%

(8) Events A and B are dependent. Suppose $P(B|A) = 0.6$ and $P(A \text{ and } B) = 0.15$. Find $P(A)$.

$$P(B|A) = \frac{P(A \text{ and } B)}{P(A)} \rightarrow \frac{.6(P(A))}{P(A)} = \frac{.15}{.6}$$

$$.6 = \frac{.15}{P(A)}$$

$$P(A) = \frac{.15}{.6} = .25$$

(9) At a gas station, 84% of customers buy gasoline. Only 5% of customers buy gasoline and a beverage. What is the probability that a customer who buys gasoline also buys a beverage?

$$P(B|A) = \frac{P(A \text{ and } B)}{P(A)}$$

$$= \frac{.05}{.84} = .05952$$

5.952%

(10) The table shows the number of species in the United States listed as endangered and threatened. Find (a) the probability that a randomly selected endangered species is a bird, and (b) the probability that a randomly selected mammal is endangered.

	Endangered	Threatened	
Mammals	70	16	<u>86</u>
Birds	80	16	<u>96</u>
Other	318	142	<u>460</u>
	468	174	<u>642</u>

a) 17.1%

b) 81.4%

- (11) A bag contains 9 red marbles, 4 blue marbles, and 7 yellow marbles. You randomly select three marbles from the bag. What is the probability that all three marbles are red when (a) you replace each marble before selecting the next marble, and (b) you do not replace each marble before selecting the next marble? Compare the probabilities.

$$a) \frac{9}{20} \cdot \frac{9}{20} \cdot \frac{9}{20} = \frac{729}{8000} = 9.1\%$$

$$b) \frac{9}{20} \cdot \frac{8}{19} \cdot \frac{7}{18} = \frac{504}{6840} = 7.4\%$$

$a > b$

- (12) A meteorologist claims that there is a 70% chance of rain. When it rains, there is a 75% chance that your softball game will be rescheduled. Your friend believed the game is more likely to be rescheduled than played. Is your friend correct? Explain your reasoning.

Yes; The chance that it will be rescheduled is $(0.7)(0.75) = 0.525$, which is greater than a 50% chance.