Name _____ Date _____ Class _____

LESSON 11-3

Practice B

Independent and Dependent Events

Find each probability.

1. A bag contains 5 red, 3 green, 4 blue, and 8 yellow marbles. Find the probability of randomly selecting a green marble, and then a yellow marble if the first marble is replaced. _____

2. A sock drawer contains 5 rolled-up pairs of each color of socks, white, green, and blue. What is the probability of randomly selecting a pair of blue socks, replacing it, and then randomly selecting a pair of white socks? _____

Two 1–6 number cubes are rolled—one is black and one is white.

3. The sum of the rolls is greater than or equal to 6 and the black cube shows a 3.
   a. Explain why the events are dependent.

   _____

   b. Find the probability. _____

4. The white cube shows an even number, and the sum is 8.
   a. Explain why the events are dependent.

   _____

   b. Find the probability. _____

The table below shows numbers of registered voters by age in the United States in 2004 based on the census. Find each probability in decimal form.

Age	Registered Voters (in thousands)	Not Registered to Vote (in thousands)
18–24	14,334	13,474
25–44	49,371	32,763
45–64	51,659	19,355
65 and over	26,706	8,033

5. A randomly selected person is registered to vote, given that the person is between the ages of 18 and 24. _____

6. A randomly selected person is between the ages of 45 and 64 and is not registered to vote. _____

7. A randomly selected person is registered to vote and is at least 65 years old. _____

A bag contains 12 blue cubes, 12 red cubes, and 20 green cubes. Determine whether the events are independent or dependent, and find each probability.

8. A green cube and then a blue cube are chosen at random with replacement. _____

9. Two blue cubes are chosen at random without replacement. _____

LESSON 11-3

Practice A

Independent and Dependent Events

Find each probability.

1. Hal is tossing a quarter.
   - **a.** What is the probability he will toss heads? $\frac{1}{2}$
   - **b.** What is the probability he will toss tails? $\frac{1}{2}$
   - **c.** What is the probability he will toss heads and then tails? $\frac{1}{4}$
2. Hal tosses a quarter three times. What is the probability the result will be tails each time? $\frac{1}{8}$
3. Katie rolls a 1–6 number cube twice. What is the probability she will roll an odd number and then an even number? $\frac{1}{4}$
4. Katie rolls the 1–6 number cube three times. What is the probability that the result will be a 3 each time? $\frac{1}{216}$

There are 3 apples and 5 oranges in a bag. Determine each probability.

5. Selecting 2 apples when they are chosen at random without replacement $\frac{3}{28}$
6. Selecting an orange, then an apple when they are chosen at random without replacement $\frac{15}{56}$

A student must have a B average or better for all courses to qualify for any athletic team at Jefferson High School. The table below shows the distribution of students' grades in three sports at the school.

Sport	Students with an A Average	Students with a B Average
Field hockey	15	4
Basketball	7	13
Football	2	22

An athlete is randomly selected. Find each probability in decimal form.

7. The student is a field hockey player with a B average. 0.063
8. The student has an A average and plays football. 0.032
9. The student has a B average and does NOT play football. 0.27

There are 4 green marbles and 3 white marbles in a bag. A white marble is randomly selected and not replaced. Then a green marble is randomly selected.

10. Are these events dependent or independent? Dependent
11. What is the probability of this event occurring? $\frac{2}{7}$

LESSON 11-3

Practice B

Independent and Dependent Events

Find each probability.

1. A bag contains 5 red, 3 green, 4 blue, and 8 yellow marbles. Find the probability of randomly selecting a green marble, and then a yellow marble if the first marble is replaced. $\frac{3}{50}$
2. A sock drawer contains 5 rolled-up pairs of each color of socks, white, green, and blue. What is the probability of randomly selecting a pair of blue socks, replacing it, and then randomly selecting a pair of white socks? $\frac{1}{9}$

Two 1–6 number cubes are rolled—one is black and one is white.

3. The sum of the rolls is greater than or equal to 6 and the black cube shows a 3.
   - **a.** Explain why the events are dependent. The events are dependent because $P(\text{sum} \geq 6)$ is different when it is known that a black 3 occurred.
   - **b.** Find the probability. $\frac{1}{9}$
4. The white cube shows an even number, and the sum is 8.
   - **a.** Explain why the events are dependent. The events are dependent because $P(\text{sum} = 8)$ is different when it is known that the white cube shows an even number.
   - **b.** Find the probability. $\frac{1}{12}$

The table below shows numbers of registered voters by age in the United States in 2004 based on the census. Find each probability in decimal form.

Age	Registered Voters (in thousands)	Not Registered to Vote (in thousands)
18–24	14,334	13,474
25–44	49,371	32,763
45–64	51,659	19,355
65 and over	26,706	8,033

5. A randomly selected person is registered to vote, given that the person is between the ages of 18 and 24. 0.52
6. A randomly selected person is between the ages of 45 and 64 and is not registered to vote. 0.09
7. A randomly selected person is registered to vote and is at least 65 years old. 0.12

A bag contains 12 blue cubes, 12 red cubes, and 20 green cubes. Determine whether the events are independent or dependent, and find each probability.

8. A green cube and then a blue cube are chosen at random with replacement. Independent; $\frac{15}{121}$
9. Two blue cubes are chosen at random without replacement. Dependent; $\frac{3}{43}$

LESSON 11-3

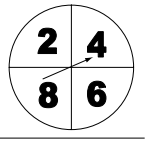
Practice C

Independent and Dependent Events

Find each probability.

1. In cooking class, students are randomly choosing 1 of 3 different recipes. Two students choose the same recipe. $\frac{1}{9}$
2. Steven rolled a 1–6 number cube four times. The result was 4 odd numbers. $\frac{1}{16}$

The spinner shown here is spun twice.



3. The sum of the results is equal to or greater than 10 and the first spin lands on 4.
   - **a.** Explain why the events are dependent. Because $P(\text{sum} \geq 10)$ is different when it is known that the first spin lands on 4.
   - **b.** Find the probability. $\frac{5}{16}$
4. The first spin lands on 6 and the sum of the results is less than or equal to 10.
   - **a.** Explain why the events are dependent. Because $P(6)$ is different when it is known that the sum of both spins is less than or equal to 10.
   - **b.** Find the probability. $\frac{1}{8}$

The table shows the population distribution in Ireland in 1996 by age and gender.

Ireland's Population in 1996					
Age Group	0–20	21–40	41–60	61–80	Over 80
Males (in thousands)	620.4	526.8	405.3	212.0	33.0
Females (in thousands)	588.3	527.6	400.8	246.3	60.3

Find each probability.

5. A randomly selected person is no more than 20 years old, given that the person is male. 0.35
6. A randomly selected person is female, given that the person is over 80 years old. 0.65

A bag contains 3 red marbles, 7 yellow marbles, 5 green marbles, and 2 blue marbles. Determine whether the events are independent or dependent, and find each probability.

7. A red marble is chosen at random and replaced, and then the SAME red marble is chosen at random again. Independent; $\frac{3}{289}$
8. A yellow marble and then a blue marble are chosen at random without replacement. Dependent; $\frac{7}{136}$

LESSON 11-3

Reteach

Independent and Dependent Events

Two events, *A* and *B*, are **independent** if the occurrence of one does not affect the probability of the occurrence of the other.

Case 1: A card is drawn from a deck and then placed back in the deck. A second card is then drawn. Events *A* and *B* are independent. (Event *B*, Event *A*)

Case 2: A card is drawn from a deck. It is not replaced. A second card is then drawn. Events *C* and *D* are NOT independent. (Event *C*, Event *D*)

Multiplication Rule for the Probability of Independent Events

A and *B* are independent events.

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

A deck of cards has 12 face cards and 40 number cards. A card is drawn from a deck and then placed back in the deck. A second card is then drawn. What is the probability of drawing two face cards from the deck? (The events are independent.)

Step 1 Find the total number of cards. $12 + 40 = 52$

Step 2 Find the probability of drawing a face card.

$P(\text{face card}) = \frac{12}{52} = \frac{3}{13}$

Step 3 Use the rule for the probability of independent events.

$P(\text{2 face cards}) = P(\text{face card}) \cdot P(\text{face card})$

$= \frac{3}{13} \cdot \frac{3}{13} = \frac{9}{169}$

What is the probability of drawing a face card and then a number card from the deck?

$P(\text{number card}) = \frac{40}{52} = \frac{10}{13}$

$P(\text{face card, then number card}) = P(\text{face card}) \cdot P(\text{number card})$

$= \frac{3}{13} \cdot \frac{10}{13} = \frac{30}{169}$

Find each probability.

1. Ben rolls a 4 and then a 5 on a 1–6 number cube.
   - **a.** $P(4)$ $\frac{1}{6}$
   - **b.** $P(5)$ $\frac{1}{6}$
   - **c.** $P(4, \text{then } 5) = P(4) \cdot P(5)$ $\frac{1}{36}$
2. Ben rolls a 3 and then an even number on a 1–6 number cube.
   - **a.** $P(3)$ $\frac{1}{6}$
   - **b.** $P(\text{even number})$ $\frac{1}{2}$
   - **c.** $P(3) \cdot P(\text{even number})$ $\frac{1}{12}$