Name _____ Date _____

12.4 Probability of Disjoint and Overlapping Events
For use with Exploration 12.4

Essential Question How can you find probabilities of disjoint and overlapping events?

Two events are **disjoint**, or **mutually exclusive**, when they have no outcomes in common. Two events are **overlapping** when they have one or more outcomes in common.

1 EXPLORATION: Disjoint Events and Overlapping Events

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner. A six-sided die is rolled. Draw a Venn diagram that relates the two events. Then decide whether the events are disjoint or overlapping.

a. Event A: The result is an even number.
Event B: The result is a prime number.

b. Event A: The result is 2 or 4.
Event B: The result is an odd number.

2 EXPLORATION: Finding the Probability that Two Events Occur

Work with a partner. A six-sided die is rolled. For each pair of events, find
(a) $P(A)$, (b) $P(B)$, (c) $P(A \text{ and } B)$, and (d) $P(A \text{ or } B)$.

a. Event A: The result is an even number.
Event B: The result is a prime number.

b. Event A: The result is a 2 or 4.
Event B: The result is an odd number.

12.4 Probability of Disjoint and Overlapping Events (continued)

3 EXPLORATION: Discovering Probability Formulas

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner.

    a. In general, if event A and event B are disjoint, then what is the probability that event A or event B will occur? Use a Venn diagram to justify your conclusion.

    b. In general, if event A and event B are overlapping, then what is the probability that event A or event B will occur? Use a Venn diagram to justify your conclusion.

    c. Conduct an experiment using a six-sided die. Roll the die 50 times and record the results. Then use the results to find the probabilities described in Exploration 2. How closely do your experimental probabilities compare to the theoretical probabilities you found in Exploration 2?

Communicate Your Answer

    4. How can you find probabilities of disjoint and overlapping events?

    5. Give examples of disjoint events and overlapping events that do not involve dice.

12.4 Notetaking with Vocabulary
For use after Lesson 12.4

In your own words, write the meaning of each vocabulary term.

compound event

overlapping events

disjoint or mutually exclusive events

Core Concepts

Probability of Compound Events

If A and B are any two events, then the probability of A or B is

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B).$$

If A and B are disjoint events, then the probability of A or B is

$$P(A \text{ or } B) = P(A) + P(B).$$

Notes:

12.4 **Notetaking with Vocabulary** (continued)

Extra Practice

1. Events A and B are disjoint. $P(A) = \frac{2}{3}$ and $P(B) = \frac{1}{6}$. Find $P(A \text{ or } B)$.

2. $P(A) = 0.8$, $P(B) = 0.05$, and $P(A \text{ or } B) = 0.6$. Find $P(A \text{ and } B)$.

In Exercises 3–6, a vehicle is randomly chosen from a parking lot. The parking lot contains three red minivans, two blue minivans, three blue convertibles, one black pickup truck, three black motorcycles, one red motorcycle and two blue scooters. Find the probability of selecting the type of vehicle.

3. A red vehicle or a minivan

4. A scooter or a black vehicle

5. A black vehicle or a motorcycle

6. A four-wheeled vehicle or a blue vehicle

12.4 **Notetaking with Vocabulary (continued)**

7. During a basketball game, the coach needs to select a player to make the free throw after a technical foul on the other team. There is a 68% chance that the coach will select you and a 26% chance that the coach will select your friend. What is the probability that you or your friend is selected to make the free throw?

8. Two six-sided dice are rolled. Find the probability of rolling the same number twice.

9. Out of 120 student parents, 90 of them can chaperone the Homecoming dance or the Prom. There are 40 parents who can chaperone the Homecoming dance and 65 parents who can chaperone the Prom. What is the probability that a randomly selected parent can chaperone both the Homecoming dance and the Prom?

10. A football team scores a touchdown first 75% of the time when they start with the ball. The team does not score first 51% of the time when their opponent starts with the ball. The team who gets the ball first is determined by a coin toss. What is the probability that the team scores a touchdown first?