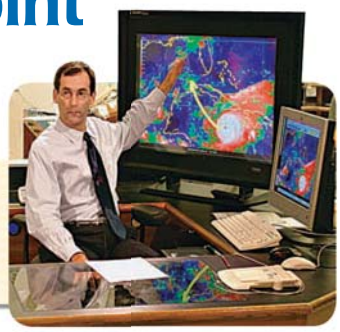
10.4 Find Probabilities of Disjoint and Overlapping Events

TEKS a.1, a.5



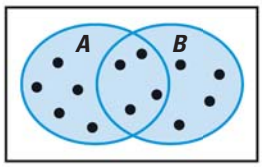
Before You found probabilities of simple events.

Now You will find probabilities of compound events.

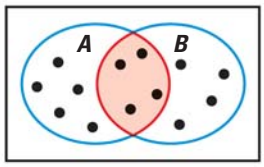
Why? So you can solve problems about meteorology, as in Ex. 44.

Key Vocabulary
- **compound event**
- **overlapping events**
- **disjoint or mutually exclusive events**

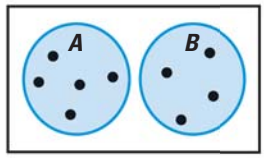
When you consider all the outcomes for either of two events A and B, you form the *union* of A and B. When you consider only the outcomes shared by both A and B, you form the *intersection* of A and B. The union or intersection of two events is called a **compound event**.



Union of A and B



Intersection of A and B



Intersection of A and B is empty.

To find $P(A \text{ or } B)$ you must consider what outcomes, if any, are in the intersection of A and B. Two events are **overlapping** if they have one or more outcomes in common, as shown in the first diagram. Two events are **disjoint**, or **mutually exclusive**, if they have no outcomes in common, as shown in the third diagram.

KEY CONCEPT *For Your Notebook*

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:

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

EXAMPLE 1 Find probability of disjoint events

A card is randomly selected from a standard deck of 52 cards. What is the probability that it is a 10 *or* a face card?

Solution

Let event A be selecting a 10 and event B be selecting a face card. A has 4 outcomes and B has 12 outcomes. Because A and B are disjoint, the probability is:

$$P(A \text{ or } B) = P(A) + P(B) = \frac{4}{52} + \frac{12}{52} = \frac{16}{52} = \frac{4}{13} \approx 0.308$$