Name ______________________ Date ____________

CHAPTER 11 More Compound Events

Probabilities often involve 2 events, called **compound events**. When we want to calculate the probability that 2 events will occur, we are calculating a **compound probability**.

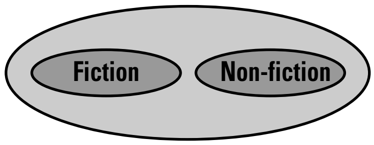
Sometimes, the two events have nothing in common (no common elements), or the two events do have common elements. When two events have no common elements, then they are called **mutually exclusive**.

EXAMPLE 1 Find the probability of mutually exclusive events

A bookshelf contains 40 books. Ten of the books are fiction, and 15 of the books are nonfiction. The remaining books are encyclopedias. A book is randomly selected from the shelf. Find the probability that the book selected is fiction or nonfiction.

Solution:

The Venn diagram shows the two events.



These events are mutually exclusive because a book cannot be both fiction and nonfiction. We add to find the probability that a fiction or nonfiction book is randomly selected:

$$P(\text{fiction or nonfiction}) = P(\text{fiction}) + P(\text{nonfiction}) = \frac{10}{40} + \frac{15}{40} = \frac{25}{40} = \frac{5}{8} \quad \blacksquare$$

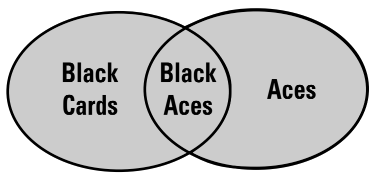
Notice that when two events A and B are mutually exclusive, then $P(A \text{ and } B) = 0$. This is because there is no chance that both outcomes could occur at the same time. When two events do have common elements, then they are **inclusive events**.

EXAMPLE 2 Find the probability of inclusive events

A full deck contains 52 cards. Find the probability of randomly selecting an ace or a black card from a full deck.

Solution:

The Venn diagram shows the two events.



There are 4 aces and 26 black cards in a full deck of cards. As shown in the Venn diagram, these are inclusive events because some aces are black (there are 2 black aces). Begin by calculating the following:

Probability of selecting an ace: $\frac{4}{52}$

CHAPTER 11 More Compound Events *continued*

Probability of selecting a black card: $\frac{26}{52}$

Probability of selecting a black ace: $\frac{2}{52}$

We will need to subtract the probability of selecting a black ace from the sum of the other two probabilities, so that the black aces are not counted twice.

$P(\text{Ace or Black}) = \frac{4}{52} + \frac{26}{52} - \frac{2}{52} = \frac{28}{52} = \frac{7}{13}$ ■

Practice

In Exercises 1–4, a) identify the following as exclusive or inclusive, and b) find the probability.

1. Brenda has 4 nickels, 2 pennies, and 8 dimes in her pocket. She randomly selects one. What is the probability that it is a penny or a dime?
2. A card is randomly selected from a full deck of cards. What is the probability that it is a red card or a face card?
3. There are 18 students in Ms. Chang's art class. Four of the students are 15 years old, twelve of the students are 16 years old, and two of the students are 17 years old. What is the probability that a randomly selected student is age 15 or 17?
4. Of the 26 employees at the Electro Company, 8 of the employees use PC computers, 14 of the employees use Mac computers, and 4 of the employees use both. What is the probability that an employee uses a PC or a Mac computer, but not both?

The table below shows the number of male and female freshman, sophomore, junior, and senior students at Valley High School.

	Freshman	Sophomore	Junior	Senior
Male	120	118	108	102
Female	134	100	102	110

Determine the probability of each situation.

5. A randomly chosen student is a freshman or a female junior.
6. A randomly chosen student is a female or a freshman.
7. A randomly chosen student is a female sophomore or a male.
8. A randomly chosen student is a female or a sophomore or junior.