

**LESSON**  
**2.3****Study Guide***For use with pages 86–93***GOAL** Use deductive reasoning to form a logical argument.**Vocabulary**

**Deductive reasoning** uses facts, definitions, accepted properties, and the laws of logic to form a logical argument.

**Law of Detachment** If the hypothesis of a true conditional statement is true, then the conclusion is also true.

**Law of Syllogism** If these statements are true,

If hypothesis  $p$ , then conclusion  $q$ .

If hypothesis  $q$ , then conclusion  $r$ .

then the following statement is true.

If hypothesis  $p$ , then conclusion  $r$ .

**EXAMPLE 1** Use the Law of Detachment

**Use the Law of Detachment to make a valid conclusion in the true situation.**

If two angles have the same measure, then they are congruent. You know that  $m\angle A = m\angle B$ .

**Solution**

First, identify the hypothesis and the conclusion of the first statement. The hypothesis is “If two angles have the same measure.” The conclusion is “then they are congruent.”

Because  $m\angle A = m\angle B$  satisfies the hypothesis of a true conditional statement, the conclusion is also true. So,  $\angle A \cong \angle B$ .

**EXAMPLE 2** Use the Law of Syllogism

**If possible, use the Law of Syllogism to write the conditional statement that follows from the pair of true statements.**

- If the electric power is off, then the refrigerator does not run.  
If the refrigerator does not run, then the food will spoil.
- If  $2x > 10$ , then  $2x > 7$ .  
If  $x > 5$ , then  $2x > 10$ .

**Solution**

- The conclusion of the first statement is the hypothesis of the second statement, so you can write the following statement.  
If the electric power is off, then the food will spoil.
- Notice that the conclusion of the second statement is the hypothesis of the first statement.  
If  $x > 5$ , then  $2x > 7$ .

LESSON  
2.3**Study Guide** *continued*  
For use with pages 86–93**Exercises for Examples 1 and 2**

1. If  $\angle A$  is acute, then  $0^\circ < m\angle A < 90^\circ$ . Angle  $B$  is an acute angle. Using the Law of Detachment, what conclusion can you make?
2. If  $B$  is between  $A$  and  $C$ , then  $AB + BC = AC$ .  $E$  is between  $D$  and  $F$ . Using the Law of Detachment, what conclusion can you make?
3. If you study hard, you will pass all of your classes. If you pass all of your classes, you will graduate. Using the Law of Syllogism, what statement can you make?
4. If  $x^2 > 9$ , then  $x^2 > 8$ . If  $x > 4$ , then  $x^2 > 9$ . Using the Law of Syllogism, what statement can you make?

**EXAMPLE 3****Use inductive and deductive reasoning****What conclusion can you make about the sum of two even integers?****Solution****STEP 1** Look for a pattern in several examples. Use inductive reasoning to make a conjecture.

$$-2 + 4 = 2, -4 + 10 = 6, 6 + 8 = 14, 12 + 6 = 18,$$

$$-20 + 14 = -6, -12 + 2 = -10, -6 + 2 = -4, -2 + (-6) = -8$$

Conjecture: Even integer + Even integer = Even integer

**STEP 2** Let  $n$  and  $m$  be any integer. Use deductive reasoning to show the conjecture is true. $2n$  and  $2m$  are even integers because any integer multiplied by 2 is even. $2n + 2m$  represents the sum of two even integers. $2n + 2m$  can be written as  $2(n + m)$ .The sum of two integers ( $n + m$ ) is an integer and any integer multiplied by 2 is even.

The sum of two even integers is an even integer.

**Exercise for Example 3**

5. What conclusion can you make about the sum of two odd integers? (*Hint*: An odd integer can be written as  $2n + 1$ , where  $n$  is any integer.)