

Notes 4.4 Apply Deductive Reasoning

pp. 227 - 229



VOCABULARY

Deductive Reasoning

Uses facts, definitions, accepted properties, and the laws of logic to form a logical argument

The Law of Detachment is also called a *direct argument*. The Law of Syllogism is sometimes called the *chain rule*.

LAWS OF LOGIC

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

Law of Syllogism

If hypothesis p , then conclusion q .

If hypothesis q , then conclusion r .

If hypothesis p , then conclusion r .

If these statements are true,

then this statement is true.



Example 1 *Use the Law of Detachment*

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

- a. If two segments have the same length, then they are congruent. You know that $AB = QR$.
- b. Jesse goes to the gym every weekday. Today is Monday.

Solution

- a. Because $AB = QR$ satisfies the hypothesis of a true conditional statement, the conclusion is also true.

So, _____.

- b. First, identify the hypothesis and the conclusion of the first statement. The hypothesis is “_____” and the conclusion is “_____”.

“Today is Monday” satisfies the hypothesis of a true conditional statement, so you can conclude that

_____.



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.

- a. If Ron eats lunch today, then he will eat a sandwich. If Ron eats a sandwich, then he will drink a glass of milk.
- b. If $x^2 > 36$, then $x^2 > 30$. If $x > 6$, then $x^2 > 36$.
- c. If a triangle is equilateral, then all of its sides are congruent. If a triangle is equilateral, then all angles in the interior of the triangle are congruent.



Solution

- a. The conclusion of the first statement is the hypothesis of the second statement, so you can write the following.

If Ron eats lunch today, then _____
_____.

- b. Notice that the conclusion of the second statement is the hypothesis of the first statement, so you can write the following.

If $x > 6$, then _____.

- c. Neither statement's conclusion is the same as the other statement's _____. You cannot use the Law of Syllogism to write a new conditional statement.



1. If $0^\circ < m\angle A < 90^\circ$, then A is acute. The measure of $\angle A$ is 38° . Using the Law of Detachment, what statement can you make?

2. State the law of logic that is illustrated below.

If you do your homework, then you can watch TV. If you watch TV, then you can watch your favorite show.

If you do your homework, then you can watch your favorite show.



Example 3**Use inductive and deductive reasoning**

What conclusion can you make about the sum of two odd integers?

Solution

Step 1 Look for a pattern in several examples. Use inductive reasoning to make a conjecture.

$$-3 + 5 = \underline{\quad}, \quad -1 + 5 = \underline{\quad}, \quad 3 + 5 = \underline{\quad}$$

$$-3 + (-5) = \underline{\quad}, \quad 1 + (-5) = \underline{\quad},$$

$$3 + (-5) = \underline{\quad}$$

Conjecture: Odd integer + Odd integer = integer



Step 2 Let n and m each be any integer. Use deductive reasoning to show the conjecture is true.

$2n$ and $2m$ are _____ integers because any integer multiplied by 2 is _____.

$2n - \underline{\hspace{1cm}}$ and $2m + \underline{\hspace{1cm}}$ are _____ integers because $2n$ and $2m$ are _____ integers.

$(2n - \underline{\hspace{1cm}}) + (2m + \underline{\hspace{1cm}})$ represents the sum of an _____ integer $2n - \underline{\hspace{1cm}}$ and an _____ integer $2m + \underline{\hspace{1cm}}$.

$$(2n - \underline{\hspace{1cm}}) + (2m + \underline{\hspace{1cm}}) = \underline{\hspace{1cm}}(n + m)$$

The result is the product of _____ and an integer $n + m$. So, _____ $(n + m)$ is an _____ integer.

The sum of two odd integers is an _____ integer.



3. Use inductive reasoning to make a conjecture about the sum of a negative integer and itself. Then use deductive reasoning to show the conjecture is true.

Homework: p. 213 – 214 1 – 19 all

