NAME Notes 10-4-2011 DATE _____ PERIOD ____

# 2-4 Study Guide and Intervention

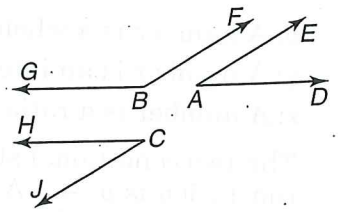
## Deductive Reasoning

**Law of Detachment** **Deductive reasoning** is the process of using facts, rules, definitions, or properties to reach conclusions. One form of deductive reasoning that draws conclusions from a true conditional $p \rightarrow q$ and a true statement $p$ is called the **Law of Detachment**.

| Law of Detachment | If $p \rightarrow q$ is true and $p$ is true, then $q$ is true. |
|---|---|
| Symbols | $[(p \rightarrow q) \wedge p] \rightarrow q$ |

Rule $P \rightarrow q$

**Example** **The statement *If two angles are supplementary to the same angle, then they are congruent* is a true conditional. Determine whether each conclusion is valid based on the given information. Explain your reasoning.**




**a. Given: $\angle A$ and $\angle C$ are supplementary to $\angle B$.** ✓
**Conclusion: $\angle A$ is congruent to $\angle C$.** ✓

The statement *$\angle A$ and $\angle C$ are supplementary to $\angle B$* is the hypothesis of the conditional. Therefore, by the Law of Detachment, the conclusion is true. Valid

**b. Given: $\angle A$ is congruent to $\angle C$.** X
**Conclusion: $\angle A$ and $\angle C$ are supplementary to $\angle B$.** X

The statement *$\angle A$ is congruent to $\angle C$* is not the hypothesis of the conditional, so the Law of Detachment cannot be used. The conclusion is not valid. Invalid

**Exercises**

**Determine whether each conclusion is valid based on the true conditional given. If not, write *invalid*. Explain your reasoning.**

Rule *If two angles are complementary to the same angle, then the angles are congruent.*

1. **Given:** $\angle A$ and $\angle C$ are complementary to $\angle B$. ✓
**Conclusion:** $\angle A$ is congruent to $\angle C$. ✓

Valid

2. **Given:** $\angle A \cong \angle C$ X
**Conclusion:** $\angle A$ and $\angle C$ are complements of $\angle B$. X

Invalid; the hypothesis and rule do not match

3. **Given:** $\angle E$ and $\angle F$ are complementary to $\angle G$. ✓
**Conclusion:** $\angle E$ and $\angle F$ are vertical angles. X

Invalid; the conclusions don't match



Lesson 2-4

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# 2-4 Study Guide and Intervention *(continued)*

## Deductive Reasoning

**Law of Syllogism** Another way to make a valid conclusion is to use the **Law of Syllogism**. It is similar to the Transitive Property.

| | |
|---|---|
| **Law of Syllogism** | If $p \rightarrow q$ is true and $q \rightarrow r$ is true, then $p \rightarrow r$ is also true. |
| **Symbols** | $[(p \rightarrow q)] \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$ |

**Example** **The two conditional statements below are true. Use the Law of Syllogism to find a valid conclusion. State the conclusion.**

(1) If a number is a whole number, then the number is an integer.
(2) If a number is an integer, then it is a rational number.

$p$: A number is a whole number.

$q$: A number is an integer.

$r$: A number is a rational number.

The two conditional statements are $p \rightarrow q$ and $q \rightarrow r$. Using the Law of Syllogism, a valid conclusion is $p \rightarrow r$. A statement of $p \rightarrow r$ is "if a number is a whole number, then it is a rational number."

**Exercises**

**Determine whether you can use the Law of Syllogism to reach a valid conclusion from each set of statements.**

**1.** If a dog eats Superdog Dog Food, he will be happy.
Rover is happy.

Invalid – No Conclusion

**2.** If an angle is supplementary to an obtuse angle, then it is acute.
If an angle is acute, then its measure is less than 90.

If an ∠ is suppl. to an obtuse ∠, then its measure is less than 90.

**3.** If the measure of $\angle A$ is less than 90, then $\angle A$ is acute.
If $\angle A$ is acute, then $\angle A \cong \angle B$.

If the m∠A is less than 90, then $\angle A \cong \angle B$.

**4.** If an angle is a right angle, then the measure of the angle is 90.
If two lines are perpendicular, then they form a right angle.

If 2 lines are ⊥, the measure of the ∠ is 90.

**5.** If you study for the test, then you will receive a high grade.
Your grade on the test is high.

Invalid – No Conclusion