

**GEOMETRY
HONORS
CLASS NOTES**

Name: _____

Section: 12.3 & 12.4 Period: _____ Date: _____

Key Question: _____

Questions/
Main Ideas:

Warm-up: Write the following as a conditional statement, its converse, and its biconditional. Determine if the biconditional is a definition.

“A bear is a warm-blooded mammal.”

Conditional: _____

Converse: _____

Biconditional: _____

Definition: _____

Notes 12.3:

- The notation for a conditional statement is $p \rightarrow q$, where p is the _____ and q is the _____.
- You say “if p then q ”
- The notation $q \rightarrow p$ would be the _____ of $p \rightarrow q$.
- The \sim symbol means _____, also called a negation.

Below is a table of more statements.

Statement	Symbols	Description
	$q \rightarrow p$	The hypothesis and conclusion are interchanged. (If q then p .)
	$\sim p \rightarrow \sim q$	The hypothesis and the conclusion are negated. (If not p then not q .)
	$\sim q \rightarrow \sim p$	The hypothesis and the conclusion are negated and interchanged. (If not q then not p .)

Example 1

Write the converse, inverse, and contrapositive of the statement: “If Ricky has brown eyes, then Lucy has red hair.”

Converse: _____

Inverse: _____

Contrapositive: _____

Example 2

Write the three if-then statements for the given conditional and determine if each is true or false.

Conditional: "If Tamika lives in Montana, then she lives in the United States."

Converse: _____

Inverse: _____

Contrapositive: _____

Notes 12.4:

- Consider the conjunction p AND $\sim p$. Since a conjunction is true if and only if both statements are true, the conjunction p AND $\sim p$ is *never* true. In fact, this statement is called a _____.

Example 1

Determine whether the given conjunction is a contradiction.

a. A triangle is a quadrilateral and a triangle is not a quadrilateral.

b. A square is a rhombus and a square is a parallelogram.

- An example of indirect reasoning is where the conclusion of a statement is negated to draw a new conclusion.
- Sarcasm is a real life example of indirect reasoning. A comment like "If that boy is over 21, then I'll be a monkey's uncle," is just an example of indirect reason. The speaker is not a monkey's uncle (a negation of the conclusion); therefore the boy cannot be over 21.

Example 2

Determine if the following statements are an example of indirect reasoning. (In your homework, you do not need to state a reason.)

a. If I fly to Paris, then I am in France. I am not in France; therefore I did not fly to Paris.

b. If I see flowers bloom, then it must be spring. I do not see flowers blooming, therefore it is not spring.

- To prove a statement is true by **contradiction** (or _____ **proof**), assume that it is false and show that this assumption leads to a contradiction. That is, to prove $p \rightarrow q$, assume that both p and $\sim q$ are true and show that this leads to a contradiction.

Example 3 – *Write an indirect proof.*

There is no largest integer. (Hint: If n is an integer, then $n + 1$ is also an integer.)

1. Write the negation of the statement and give the integer a name.
2. Add one to your integer.
3. Show that this leads to a contradiction and draw a conclusion.

Summary: _____
