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1.7/1.8. Honors Geometry

DATE: 9/21

Target 1D. Use deductive reasoning and logic.

- **Theorem 3:** If a conditional statement is true, then the contrapositive of that statement is also true. (If p , then q is equivalent to if $\sim q$, then $\sim p$.) Symbolically, it can be written as follow:

$$p \rightarrow q \leftrightarrow \sim q \rightarrow \sim p$$

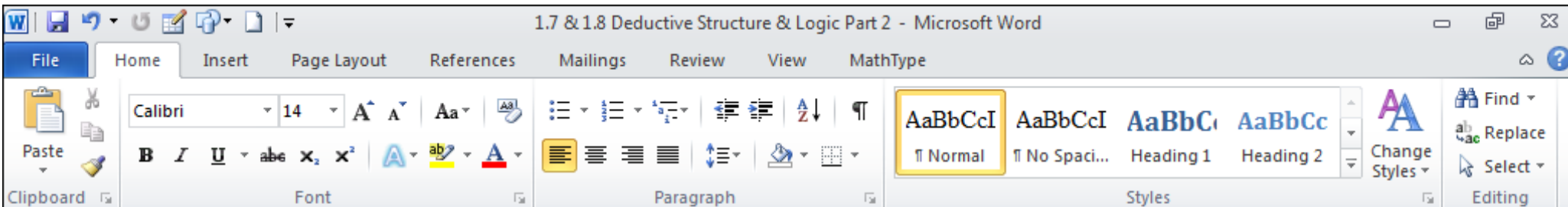
- **Law of Syllogism (Chain of Reasoning):** If $p \rightarrow q$ and $q \rightarrow r$ are true statements, then $p \rightarrow r$ is a true statement.
- Use the Law of Syllogism to draw a conclusion.

$$\left. \begin{array}{l} p \rightarrow q \\ q \rightarrow r \end{array} \right\} \therefore p \rightarrow r$$

$$\begin{array}{l} C \rightarrow t \\ t \rightarrow w \\ \therefore C \rightarrow w \end{array}$$

- 1) If the circus is in town, then there are tents at the fairground. If there are tents at the fairground, then Eli is working as a night watchman.
- $\underbrace{\hspace{10em}}_C \quad \underbrace{\hspace{10em}}_t \quad \underbrace{\hspace{10em}}_w$

"If the circus is in town, then Eli is working as a night watchman."



$b \rightarrow o$
 $o \rightarrow f$
 $\therefore b \rightarrow f$

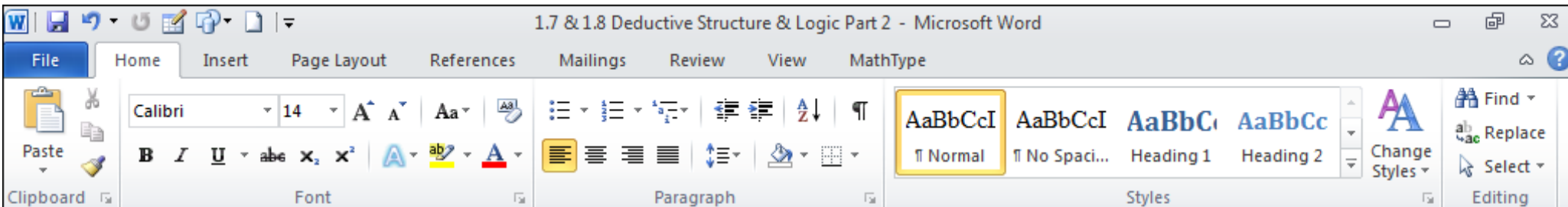
2) If you vacation at the beach, then you must like the ocean. If you like the ocean, then you will like Florida.
If you vacation at the beach, then you will like Florida.

$e \rightarrow r$
 $r \rightarrow \sim w$
 $\therefore e \rightarrow \sim w$

3) The Volga River is in Europe. If a river is less than 2300 miles long, then it is not one of the world's ten longest rivers. If a river is in Europe, then it is less than 2300 miles long.

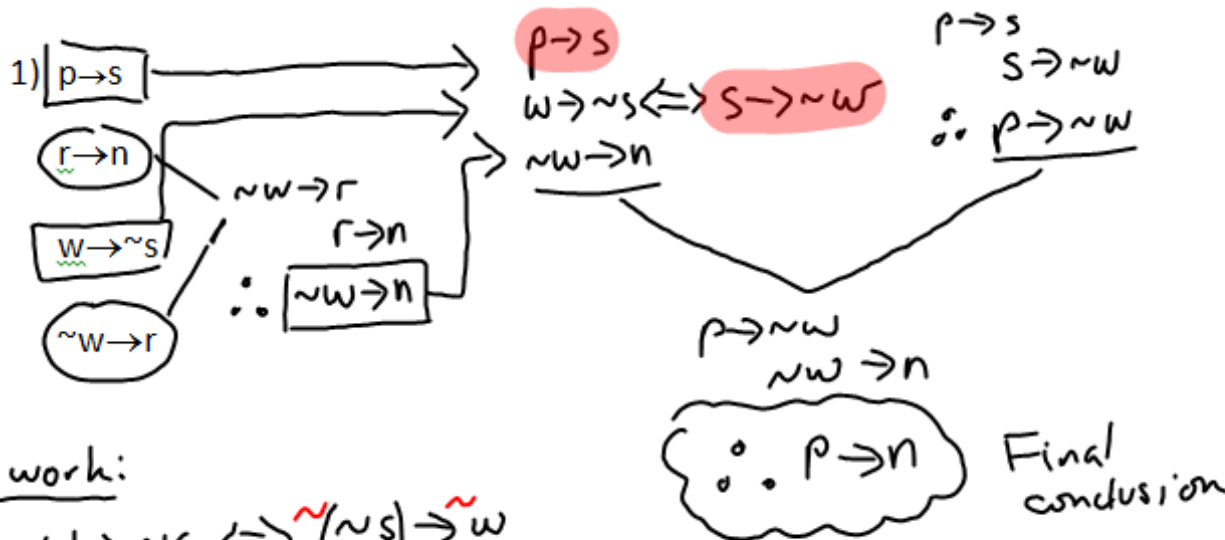
The Volga river is not one of the world's ten longest rivers.

Also, The Volga river is less than 2300m long.



Remember $p \rightarrow r \wedge r \rightarrow s \Rightarrow p \rightarrow s$, $r \rightarrow p \Leftrightarrow \sim p \rightarrow \sim r$
 (contrapositive)

- Draw a conclusion from the following:



Side work:

$$w \rightarrow \sim s \Leftrightarrow \sim(\sim s) \rightarrow \sim w$$

$$\Leftrightarrow s \rightarrow \sim w$$

- 2) If Bob likes bagels, then Marie mashes mice.

If Gerardo does not greet geese, then Hillary hikes hills.

If Gerardo greets geese, then Marie does not mash mice.

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2) If Bob likes bagels, then Marie mashes mice.

b m

If Gerardo does not greet geese, then Hillary hikes hills.

$\sim g$ h

If Gerardo greets geese, then Marie does not mash mice.

g $\sim m$

We have:

$b \rightarrow m$
 $\sim g \rightarrow h$
 $g \rightarrow \sim m$

Try it!

Ans: $b \rightarrow h$