Mr. Baroody's Web Page

Statements of Logic - Lesson 1-8

Here's a warmup:
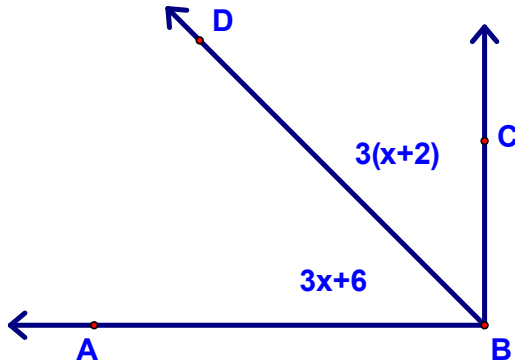
Given: $\overrightarrow{BD}$ **bisects ∠ABC.**

Prove: ∠ABC **is a right ∠.**

Today, we'll discuss conditional statements (those of the form if...then...). First, let's decompose them into their component parts, and then talk about the negation of a conditional statement.

Conditional statements are ones of the form **"If...,then..."**

The clause following the word if is called the *hypothesis.*

The clause following the word then is called the *conclusion.*

The conditional statement "If p, then q" can be written in symbols as $p \Rightarrow q$.

The *negation* of any statement p is "not p" or $\sim p$ in symbols. Note that $\sim \sim p$ is generally equal to p.

Next, let's talk about the converse, inverse, and contrapositive of conditional statements.

Every conditional statement "If p, then q" has three other statements associated with it:
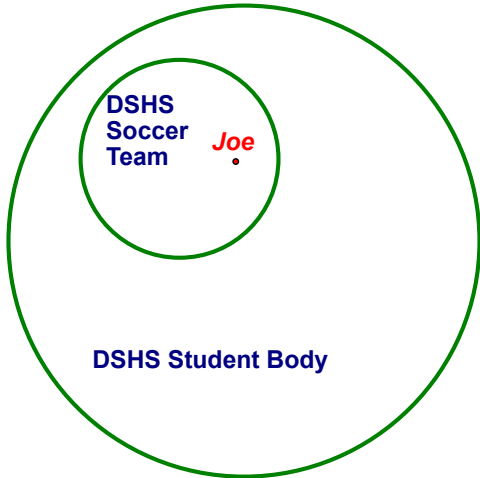
A *converse* (If q, then p.)

An *inverse* (If $\sim p$, then $\sim q$.)

A *contrapositive* (If $\sim q$, then $\sim p$.)

We will now talk about Venn Diagrams and how they could help us to evaluate the various forms of conditional statements...can you answer the questions below?

If Joe is a member of the DSHS Soccer team, then he is a member of the DSHS student body.

DSHS Soccer Team   *Joe*

DSHS Student Body

Is the converse (If *q*, then *p*.) true?

Is the inverse (If ~ *p*, then ~ *q*.) true?

Is the contrapositive (If ~ *q*, then ~ *p*.) true?

Theorem 3 **- If a conditional statement is true, then the contrapositive of the statement is also true (If *p*, then *q* ⇒ If ~ *q*, then ~ *p*.).**

Next is the Chain Rule - something can be applied to conditional statements and is often used in proofs!:

In many cases, a proof will follow a logical argument called *the chain rule*:

If *p* ⇒ *q* and *q* ⇒ *r*, then *p* ⇒ *r*.

For example, if we accept the two statements "*If you study hard, then you will earn a good grade*" and "*If you earn a good grade, then your family will be happy*" what can we conclude?

"*If you study hard, then your family will be happy.*"

Remember the hint I gave you for solving chain rule type problems: you may need to use the contrapositive of some of the given statements in order to solve the chain! Here's an example that you can try to solve:

Draw a conclusion from the following statements:

If gremlins grow grapes, then elves eat earthworms

If trolls don't tell tales, then wizards weave willows

If trolls tell tales, then elves don't eat earthworms