

Warm-up

1. If $p \rightarrow q$ is true, what must also be true? What is that called?

$\sim q \rightarrow \sim p$ Contrapositive

2. If $q \rightarrow p$ is false, what must also be false? What is that called?

$\sim p \rightarrow \sim q$ Inverse

3. The converse of a statement is: If it likes cheese, then it is a mouse. Is this true? If not, give a counterexample.

No, Egan likes cheese!

To create a *Biconditional Statement*, combine a conditional statement and its converse.

Notation: $p \leftrightarrow q$

Two angles are congruent if and only if their measures are equal.

conditional: IF 2 \angle 's are \cong , then their measures are $=$.

converse: IF 2 \angle 's have $=$ measures, then they are \cong .

conditional: If two angles share a side, then they are adjacent.



converse: IF 2 \angle 's are adjacent, then they share a side.

biconditional: 2 \angle 's are adjacent if and only if they share a side.

Is the following biconditional statement true?
If not, provide a counterexample.

The date can be the 29th if and only if it is February.

IF the date is the 29th, then it is February.

False! Could be 29th of September.

Law of Detachment

If $p \rightarrow q$ is a true statement and p is true,
then q is true. ① happens ②
must be true ③

ie: if a conditional statement is true, and the hypothesis occurs, then the conclusion must also occur

Given: In the World Series, if a team wins four games, then that team is the Champion. True
In 1995, the Atlanta Braves won four games in the World Series. hypothesis happened!

Conjecture: The Atlanta Braves won the 1995 World Series. True (must be).
Valid by Law of Detachment.

Given: If a person sees penguins, then that person is in Antarctica. Maggie sees penguins.

Conjecture: Maggie is in Antarctica.

False (or invalid by Law of Detachment)
because conditional statement is not necessarily true. Maggie could be @ the zoo

Law of Syllogism

If $\underline{p} \rightarrow q$ and $q \rightarrow r$ are both true conditional statements, then $p \rightarrow \underline{r}$ is a true statement.

Given: If we do well on today's pop-quiz, then our teacher will not give us homework. If our teacher does not give us homework, then I will go get ice cream.

Conclusion: If we do well on today's pop-quiz, then I will go get ice cream.

If Maggie wakes up, then Will will cry. ③

If Murphy barks, then the neighbors will complain. ⑤

If I stub my toe, then I will scream. ①

If Will cries, then Murphy will bark. ④

If I scream, then Maggie will wake up. ②

If I stub my toe, then the
neighbors will complain.