

Conditional & Bi-conditional Statements

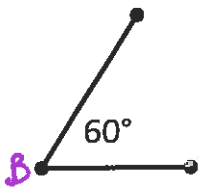
Logical Statement: A logical statement is a statement that is either **TRUE** or **FALSE**.

Negation: Changing the truth value of a logical statement using the word “NOT”.

Example: Explain why the statement is FALSE based on the provided picture. Write the negation of the statement.

\perp = perpendicular.

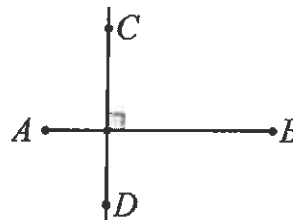
1. Statement: $\angle B$ is a right angle.



FALSE because $\angle B$ is not 90°

Negation: $\angle B$ is not a right angle.

2. Statement: \overline{AB} and \overline{CD} are not perpendicular.



FALSE because \overline{AB} and \overline{CD} form a rt \angle .

Negation: \overline{AB} and \overline{CD} are \perp .

Conditional Statement: A statement written in the form: **IF....THEN....**

In geometry, **Theorems** and **Postulates** are written as conditional statements.

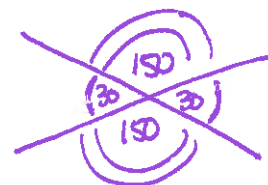
Example: For each conditional statement, identify the condition and the conclusion.

3. The Right Angle Theorem:

If $\overbrace{2 \text{ angles are right}}^{\text{subject condition}}$, then they $\overbrace{\text{are congruent}}^{\text{conclusion}}$.

4. The Vertical Angle Theorem:

If $\overbrace{2 \text{ angles are vertical}}^{\text{subject condition}}$, then they $\overbrace{\text{are congruent}}^{\text{conclusion}}$.



Logical Equivalence:

condition

conclusion

logically equivalent

Statement: If I live in Horseheads, then I live in NY State.

Switch parts

Converse: If I live in NYS, then I live in Horseheads.

Negate parts

Inverse: If I don't live in Horseheads, then I don't live in NYS.

Switch & Negate

Contrapositive: If I don't live in NYS, then I don't live in Horseheads

the contrapositive is always logically equivalent to the original!!

Example: Write a conditional that is logically equivalent to the given statement.

cond.

concl.

5. "If a segment is a segment bisector, then it passes through the midpoint of another segment."

Switch & Negate

If a segment does not pass thru the midpoint of another segment, then it is not a segment bisector.

cond.

concl.

6. "If two angles are right, then they are congruent."

If 2 angles are not congruent, then they are not right.

Bi-conditional: A statement written in the form: ...IF AND ONLY IF...

~~~~~ ← Bi-conditional

In geometry, some Theorems and Postulates are written in the Bi-Conditional form.

Example: The Congruency Postulate:

Two segments are congruent if and only if they have the same measure.

iff

A Bi-Conditional is formed by joining 2 conditional statements:

Statement: I win a gold medal, if and only if I come in first place

Forwards

Conditional #1: If I win a gold medal, then I come in first place.

backwards

Conditional #2: If I come in first place, then I win a gold medal.

\*Notice, these conditionals are converses of each other\*

Example: Write the converse of the statement. If the converse is true, combine both statements into a single bi-conditional.

7. "If two segments have the same measure, then they are congruent."

Converse: If 2 segments are congruent, then they have the same measure.

Bi-conditional: Two segments are congruent if and only if they have the same measure.

8. "If 2 angles are right, then they are congruent."

Converse: If 2  $\angle$ s are  $\cong$ , then they are right. (False)

Bi-conditional: Not possible.

In geometry, the **Definition** of an object can always be rewritten formally as a Bi-conditional.

Example: Segment Bisector

Informal definition: A line, ray, or segment that passes through the midpoint of another segment.

Formal Bi-Cond: A line, ray or segment is a segment bisector. if and only if it passes thru the midpoint of another segment.

\* both true!

