Geometry – Mr. Bo
Unit 3 – Day 1 Notes v2

Name: Key
Date: 0

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".

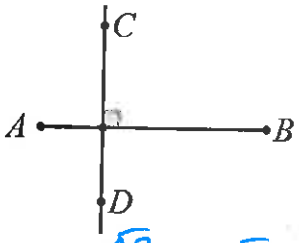
Example: Explain why the statement is FALSE based on the provided picture. Write the negation of the statement.

1. Statement: ∠B is a right angle.

FALSE because ∠B is not 90°.

Negation: ∠B is not a Rt angle.

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



FALSE because $\overline{AB}$ and $\overline{CD}$ meet at a Rt ∠.

Negation: $\overline{AB}$ and $\overline{CD}$ are perpendicular.

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 *2 angles* *are right,* **then** *they* *are congruent.*

(2 angles: subject; are right: condition; are congruent: conclusion)

4. **The Vertical Angle Theorem:**

If *2 angles* *are vertical,* **then** *they* *are congruent.*

(2 angles: subject; are vertical: cond.; are congruent: conclusion)

Logical Equivalence:

Statement: If I live in Horseheads, then I live in NY State. (true)
(condition) (conclusion)

Switch parts — **Converse:** If I live in NY, then I Live in H.H. (False)

negate parts — **Inverse:** If I Don't live in H.H., then I don't live in NY. (False)

Switch + negate. — **Contrapositive:** If I Don't live in NY., then I Don't live in H.H. (True)

logically equivalents

* the contrapositive is logically equivalent to the original conditional.

Example: Write a conditional that is logically equivalent to the given statement.
→ contra-positive.

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

If a Seg. does not pass through a midpt of another segment, then it is not a segment bisector.

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

If 2 ∠'s are not ≅, then they are not right.

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

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.

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 came in first place. (true)

(backwards) **Conditional #2:** If I come in 1st place, then I win a gold medal. (true)

* 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."* (True)

Same truth value

Converse: If 2 segs. are $\cong$, then they have the same measure. (True)

Bi-conditional: 2 segs. are $\cong$ if and only if they have the same measure.

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

opp. truth value

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 seg bisector if and only if it passes through the midpt of another segment.