2-1 If-then Statements and Converses

Sept 16

An "if-then" statement is a *conditional*.

Example 1: **If $\angle A$ is a right angle, then $m\angle A = 90$.**

p = hypothesis; q = conclusion

if p, then q

Other forms:

$\angle A$ is a right angle implies $m\angle A = 90$. — p implies q

$\angle A$ is a right angle only if $m\angle A = 90$. — p only if q

then $m\angle A = 90$ if $\angle A$ is a right angle. — q, if p

(then: conclusion; if: hypothesis)

The *converse* of a conditional statement is formed by switching the hypothesis and conclusion.

Example 2: **If $m\angle B = 110$, then $\angle B$ is obtuse.** H, C, T

if p, then q.

Converse: If $\angle B$ is obtuse, then $m\angle B = 110$. F

if q, then p.

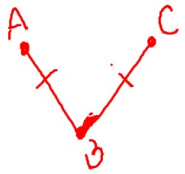
A *counterexample* is an example that shows why a statement is false.

Example 3: **Give a counterexample to show why the statement is false.**

a) If $x^2 = 49$, then $x = 7$.

$x = -7$

b) If $\overline{AB} \cong \overline{BC}$, then B is the midpoint of $\overline{AC}$.



A *biconditional* is a statement that combines a conditional and its converse.

p if & only if q.

Conditional If $\overline{DE} \cong \overline{FG}$, then $DE = FG$. T

Converse If $DE = FG$, then $\overline{DE} \cong \overline{FG}$. T

Biconditional $\overline{DE} \cong \overline{FG}$ (H) if and only if $DE = FG$. (C)

Example 4: **Write this pair of conditionals as a biconditional.**

If two angles are congruent, then their measures are equal.
If the measures of two angles are equal, then they are congruent.

Two ∠s are congruent if and only if their measures are equal.

Example 5: **Write the biconditional as two conditionals that are converses of each other.**

An angle is (H) acute if and only if its measure is less than 90° (C).

If an angle is acute, then its measure is less than 90°.
If its measure is less than 90°, then an angle is acute.