

2.3 Conditional and Biconditional Statements

**Conditional Statement:** has 2 parts  $\rightarrow$  a logical statement

1) hypothesis

2) conclusion

If-then  
statements

1. If it is noon in Georgia, then it is 9am in California.

hypothesis

conclusion

Rewrite the following statements into if-then form

2. Two points are collinear if they lie on the same line.

If two points lie on the same line, then they are collinear

3. All sharks have a boneless skeleton.

If a fish is a shark, then it has a boneless skeleton

To prove true  $\rightarrow$  must prove for ALL cases

To prove false  $\rightarrow$  counterexample

Ex. Find a counterexample for:

If  $x^2 = 16$ , then  $x = 4$ .

$$x = -4$$

**Converse:** formed by switching the hypothesis and conclusion

Ex.

Statement: If you see lightning then you hear thunder.

Converse: If you hear thunder, then you see lightning

false

## 2.3 Conditional and Biconditional Statements

Perpendicular Lines: intersect to form a right angle.

\*Can be interpreted "forward" and "backward"

1. If two lines are perpendicular, then they intersect to form a right angle
2. If two lines intersect to form a right angle, then they are perpendicular

Note: Converse of first statement is still true!

**Biconditional statement:** conditional statement that contains the phrase "if and only if" \* if-then statement and converse\*

Ex. Three lines are coplanar if and only if they lie on the same plane.

Conditional Statement: If 3 lines are coplanar then they same plane

Converse: If 3 lines are on the same plane then they are coplanar

True Biconditional Statement when:

1. conditional statement true (if-then)
2. Converse true (flip hyp & conclusion)

False Biconditional Statement when:

either conditional or converse is false

## 2.3 Conditional and Biconditional Statements

Examples:

1. Determine if the following biconditional statement is true:

"x = 3 if and only if  $x^2 = 9$ "Conditional Statement : If  $x = 3$  then  $x^2 = 9$  <sup>True</sup>Converse : If  $x^2 = 9$  then  $x = 3$  Falsecounterexample :  $x = -3$ 

2. Write the converse of the statement below. If the converse is true, write the biconditional statement:

"If a line contains two points then the points are collinear."Converse : If two points are collinear  
then <sup>the</sup> two <sup>pts</sup> are contained in  
a line

true

Two pts are collinear if and only if the two pts  
are contained in a line

