

Geometry CC
Conditional and Biconditional Statements

Conditional Statement: has 2 parts \rightarrow a logical statement

- 1) hypothesis
- 2) conclusion

* If-then
statement

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

hypothesis

conclusion

Rewrite the following statements into if-then form

2. I'll wash the car if the weather is nice.

If the weather is nice, then I'll wash the car

3. I'll be a millionaire if I win monopoly.

If I win monopoly, then I'll be a millionaire

To prove true \rightarrow must prove for all cases

To prove false \rightarrow counterexample

\downarrow
one example that breaks your conclusion

Ex. Find a counterexample for:

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

$x = -4$ counterexample $\text{b/c } (-4)^2 = 16$

Converse: formed by switching the hypothesis and conclusion

4.

Statement: If you see lightning then you hear thunder.

Converse: If you hear thunder, then you see lightning

false statement

5.

Statement: If you ~~play~~ like football, then you are on the football team.

Converse: If you are on the football team,
then you like football

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 & converse

Ex. I am breathing if and only if I am alive.

* If, then *

Conditional Statement: If I am alive, then I am breathing

Converse: If I am breathing, then I am alive

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

Examples:

1. Determine if the following biconditional statement is true:

" $x = 3$ if and only if $x^2 = 9$ "

Conditional: If $x^2 = 9$, then $x = 3$ False

Converse: If $x = 3$, then $x^2 = 9$ True

counterexample $x = -3$

Biconditional is false

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

"If the tea kettle is whistling then the water is boiling."

Converse: If the water is boiling then the tea kettle is whistling.

Both true

Biconditional: The tea kettle is whistling if and only if the water is boiling.

★
if and
only if

