

Definition of Conditional Statements:

Statement written in "if then" format

Example 1: State the hypothesis and the conclusion.

If you are a ^Pbrunette, then you have ^Qbrown hair.

Hypothesis: you are a brunette

Conclusion: you have brown hair

Statements can be written as Conditional Statements:

- Try to use the verb as the place where we separate the hypothesis from the conclusion.
- Identify the P & Q

Example 2: Write a conditional statement

Statement: Vertical angles ^Pare ^Qcongruent.

Conditional Statement:

If the angles are vertical,
then they are congruent.
(\cong)

Example 3: Write a conditional statement.

Statement: Two angles that form a linear pair ^Pwill ^Qbe supplementary.

Conditional Statement:

If two angles form a linear pair, then they are supplementary.

Counter Examples:

used to show a conditional statement is false.
* a counter example must keep the hypothesis true,
but the conclusion can be proven false.

Find a counter example to prove the statement is false.

Example: If $x^2 = 81$, then x must equal 9.

Counter example:

$x = -9$ (proves the
Q false)

(90°)
If $\angle A$ and $\angle B$ are complementary, then
 $m\angle A = 50^\circ$ and $m\angle B = 40^\circ$.

Counter example:

$m\angle A = 60$
 $m\angle B = 30$

| Type | Example | Symbols | Helpful Hint | Truth Value |
|--|---|--------------------------------|--|---------------------|
| Conditional If a polygon has exactly 3 sides, then the polygon is a triangle. | If $\angle A$ and $\angle B$ are complementary, then $m\angle A = 60^\circ$ and $m\angle B = 120^\circ$. | $P \rightarrow q$ | "if then" | T |
| Converse | If a polygon is a triangle then the polygon has exactly 3 sides. | $q \rightarrow p$ | Converse shoes on wrong feet. | T |
| Inverse o t | If a polygon does not have exactly 3 sides, then the polygon is not a triangle. | $\sim p \rightarrow \sim q$ | Negate both P & q. | T |
| Contrapositive | If a polygon is not a triangle, then it does not have exactly 3 sides. | $\sim q \rightarrow \sim p$ | Switch & negate | T |
| Biconditional | A polygon has exactly 3 sides iff the polygon is a triangle. | $p \leftrightarrow q$ (iff) | iff (if & only if) *drop if & then. | All has to be True! |

Example 6: Write the converse, inverse, and contrapositive then find the truth value for each statement. If appropriate, then write the biconditional statement.

cond: P q (T)
If an angle is 90° , then it is a right angle. (T)

(T/F) Converse: If it is a right angle, then the angle is 90° .

(T/F) Inverse: If an angle is not 90° , then it is not a right angle.

(T/F) Contrapositive: If an angle is not a right angle, then it is not 90° .

(T/F) Biconditional: An angle is 90° iff it is a right angle.