

2.8 Symbolic Notation and Truth Tables

Conditional statements can be written using *symbolic notation*, where letters are used to represent statements. An arrow (\rightarrow), read "implies", connects the hypothesis and conclusion. To write the negation of a statement p you write the symbol for negation (\sim) before the letter. So, "not p " is written $\sim p$.

KEY CONCEPT

For Your Notebook

Symbolic Notation

Let p be "the angle is a right angle" and let q be "the measure of the angle is 90° ."

Conditional	If p , then q .	$p \rightarrow q$
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Example: If an angle is a right angle, then its measure is 90° .

Converse	If q , then p .	$q \rightarrow p$
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Example: If the measure of an angle is 90° , then the angle is a right angle.

Inverse	If not p , then not q .	$\sim p \rightarrow \sim q$
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Example: If an angle is not a right angle, then its measure is not 90° .

Contrapositive	If not q , then not p .	$\sim q \rightarrow \sim p$
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If the measure of an angle is not 90° , then the angle is not a right angle.

Biconditional	p if and only if q	$p \leftrightarrow q$
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Example: An angle is a right angle if and only if its measure is 90° .

truth value - tells whether a statement is either true (T) or false (F),
if a hypothesis is true but the conclusion is false then the truth value is
FALSE

truth table - shows the truth values for the hypothesis p and the
conclusion q

Ex 1: Let p be "the car is running" and q be "the key is in the ignition". State whether each statement is TRUE or FALSE. (no key-less start-up)

(a) Write the conditional statement $p \rightarrow q$ in words.

If the car is running, then the key is in the ignition. T

(b) Write the converse $q \rightarrow p$ in words.

If the key is in the ignition, then the car is running. F

(c) Write the inverse $\sim p \rightarrow \sim q$ in words.

If the car is not running, then the key is not in the ignition. F

(d) Write the contrapositive $\sim q \rightarrow \sim p$ in words.

If the key is not in the ignition, then the car is not running. T

Ex 2: Complete the truth table with the negations, conditional, converse, inverse, and contrapositive.

		Negation	Negation	Conditional	Converse	Inverse	Contrapositive
p	q	$\sim p$	$\sim q$	$p \rightarrow q$	$q \rightarrow p$	$\sim p \rightarrow \sim q$	$\sim q \rightarrow \sim p$
T	T	F	F	T	T	T	T
T	F	F	T	F	T	T	F
F	T	T	F	T	F	F	T
F	F	T	T	T	T	T	T

Ex 3: Use the statement "If you live in Dos Vientos, then you live in California." Make a table for the converse.

		Converse	Statement
p	q	$q \rightarrow p$	
T	T	F	If you live in California, then you live in Dos Vientos.
T	F	F	If you don't live in California, then you do live in D.V.
F	T	F	If you live in California, then you don't live in D.V.
F	F	T	If you don't live in California, then you don't live in D.V.