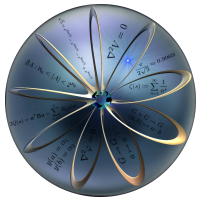

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biconditional

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1 Biconditional

A *biconditional* is a truth function that is true only in the case that both parameters are true or both are false.

Symbolically, the biconditional is written as

$$a \Leftrightarrow b$$

or

$$a \leftrightarrow b$$

with the latter being rare outside of formal logic. The truth table for the biconditional is

a	b	$a \Leftrightarrow b$
F	F	T
F	T	F
T	F	F
T	T	T

The biconditional function is often written as "iff," meaning "if and only if."

It gets its name from the fact that it is really two conditionals in conjunction,

$$(a \to b) \wedge (b \to a)$$

This fact is important to recognize when writing a mathematical proof, as both conditionals must be proven independently.

2 Colloquial Usage

The only unambiguous way of stating a biconditional in plain English is of the form "b if a and a if b." Slightly more formal, one would say "b implies a and a implies b." The plain English "if" may sometimes be used as a biconditional. One must weigh context heavily.

For example, "I'll buy you an ice cream if you pass the exam" is meant as a biconditional, since the speaker doesn't intend a valid outcome to be buying the ice cream whether or not you pass the exam (as in a conditional). However, "it is cloudy if it is raining" is *not* meant as a biconditional, since it can obviously be cloudy while not raining.