

2.8 The Biconditional

Biconditional statement:

$$p \leftrightarrow q$$

"If p then q and vice versa."

" p if and only if q "

"If and only if p then q ."

Means: $p \rightarrow q$ and $q \rightarrow p$.

Truth table for $p \leftrightarrow q$

p	q	$p \leftrightarrow q$
0	0	1
0	1	0
1	0	0
1	1	1

Ex: Show that $p \leftrightarrow q$ is logically equivalent
to $(p \rightarrow q) \wedge (q \rightarrow p)$

p	q	$p \leftrightarrow q$	$p \rightarrow q$	$q \rightarrow p$	$(p \rightarrow q) \wedge (q \rightarrow p)$
0	0	1	1	1	1
0	1	0	1	0	0
1	0	0	0	1	0
1	1	1	1	1	1

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Identical

Ex: The following statement is true:

"Snarks are Boojums if and only if the bellman is incorrect."

Answer Yes, No or Maybe.

a) Snarks are Boojums. Is the bellman correct?

No

b) Snarks are not Boojums. Is the bellman correct?

Yes

c) The bellman is correct. Are Snarks Boojums?

No

d) The bellman is incorrect. Are Snarks Boojums?

Yes