

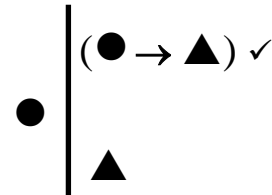
## 4.5. Truth Trees: Conditionals and Biconditionals

Having in the previous chapter translated truth-table-style semantic rules into truth tree format, doing so for the conditional and biconditional rules poses no surprises.

The conditional rule states that a conditional is only false in one case: where the antecedent is true, but the consequent is false. So the truth tree rule says the same, in vertical line notation.

●	▲	(● → ▲)
1	1	1
⇒ 1	0	0 ⇐
0	1	1
0	0	1

### False Conditional



There are three ways to make the conditional true.

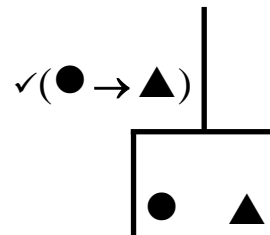
●	▲	(● → ▲)
1	1	1 ⇐
1	0	0
0	1	1 ⇐
0	0	1 ⇐

But as with true disjunctions and false conjunctions, we can distill these three cases down to two. For whenever the **conditional** is **true** either the **antecedent is false** (Valuations 3 and 4) **or** the **consequent is true** (Valuations 1 and 3) – possibly both (as in Valuation 3, which is just the overlap of these two cases).

That states the truth tree rule for true conditionals.

●	▲	$(\bullet \rightarrow \blacktriangle)$
1	1	1 $\Leftarrow$
1	0	0
0	1	1 $\Leftarrow$
0	0	1 $\Leftarrow$

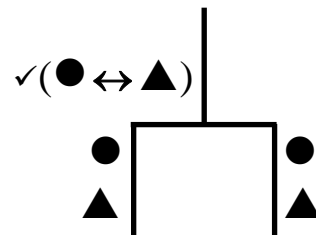
### True Conditional



Biconditionals will prove our branchiest connective. They branch when the biconditional is true (because there are two ways to make a biconditional true).

●	▲	$(\bullet \leftrightarrow \blacktriangle)$
1	1	1 $\Leftarrow$
1	0	0
0	1	0
0	0	1 $\Leftarrow$

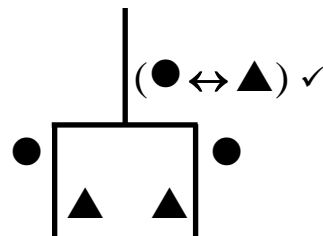
### True Biconditional



And they branch when the biconditional is false (because there are two ways to make a biconditional false).

●	▲	$(\bullet \leftrightarrow \blacktriangle)$
1	1	1
1	0	0 $\Leftarrow$
0	1	0 $\Leftarrow$
0	0	1

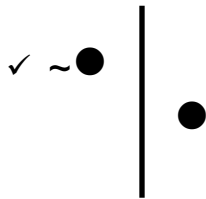
### False Biconditional



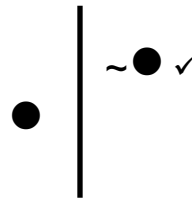
All of the procedures for testing with truth trees remain unchanged from the previous chapter. In particular, we will break down non-branching sentences before branching sentences. So *false conditionals* will go in the non-branching bin, while *true conditionals*, and *all biconditionals*, go in the branching bin.

### Summary: Chapter Four Truth Tree Rules

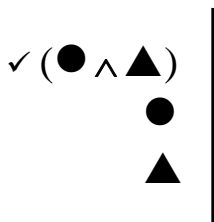
#### True Negation



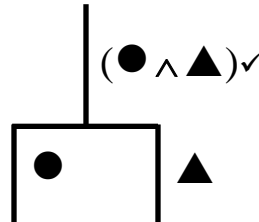
#### False Negation



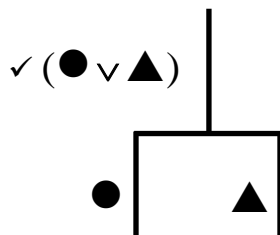
#### True Conjunction



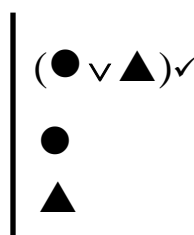
#### False Conjunction

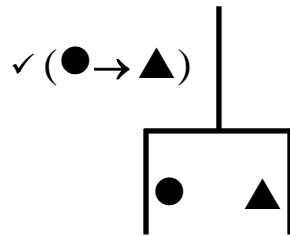
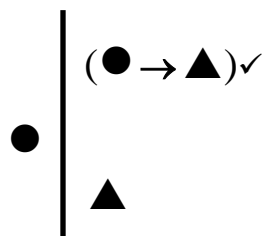
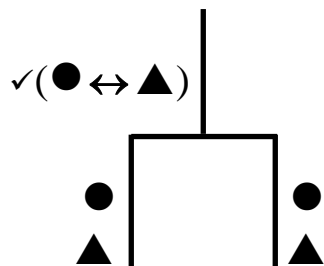


#### True Disjunction



#### False Disjunction



**True Conditional****False Conditional****True Biconditional****False Biconditional**