

Statement	Ways to Prove it	Ways to Use it	How to Negate it
p	<ul style="list-style-type: none"> • Prove that p is true. • Assume p is false, and derive a contradiction. 	<ul style="list-style-type: none"> • p is true. • If p is false, you have a contradiction. 	not p
p and q	<ul style="list-style-type: none"> • Prove p, and then prove q. 	<ul style="list-style-type: none"> • p is true. • q is true. 	(not p) or (not q)
p or q	<ul style="list-style-type: none"> • Assume p is false, and deduce that q is true. • Assume q is false, and deduce that p is true. • Prove that p is true. • Prove that q is true. 	<ul style="list-style-type: none"> • If $p \Rightarrow r$ and $q \Rightarrow r$ then r is true. • If p is false, then q is true. • If q is false, then p is true. 	(not p) and (not q)
$p \Rightarrow q$	<ul style="list-style-type: none"> • Assume p is true, and deduce that q is true. • Assume q is false, and deduce that p is false. 	<ul style="list-style-type: none"> • If p is true, then q is true. • If q is false, then p is false. 	p and (not q)
$p \iff q$	<ul style="list-style-type: none"> • Prove $p \Rightarrow q$, and then prove $q \Rightarrow p$. • Prove p and q. • Prove (not p) and (not q). 	<ul style="list-style-type: none"> • Statements p and q are interchangeable. 	(p and (not q)) or ((not p) and q)
$(\exists x \in S) P(x)$	<ul style="list-style-type: none"> • Find an x in S for which $P(x)$ is true. 	<ul style="list-style-type: none"> • Say “let x be an element of S such that $P(x)$ is true.” 	$(\forall x \in S) \text{ not } P(x)$
$(\forall x \in S) P(x)$	<ul style="list-style-type: none"> • Say “let x be any element of S.” Prove that $P(x)$ is true. 	<ul style="list-style-type: none"> • If $x \in S$, then $P(x)$ is true. • If $P(x)$ is false, then $x \notin S$. 	$(\exists x \in S) \text{ not } P(x)$

Table 1: Logic in a nutshell.