

## Contrapositive

We showed  $p \rightarrow q \equiv \neg q \rightarrow \neg p$  with a truth table. Let's do a proof.

Try this one on your own. Remember

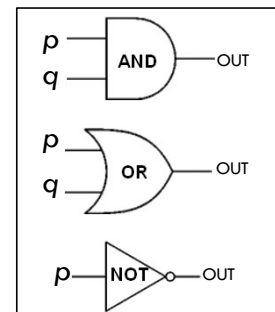
1. Know what you're trying to show.
2. Stay on target – take steps to get closer to your goal.

Hint: think about your tools.

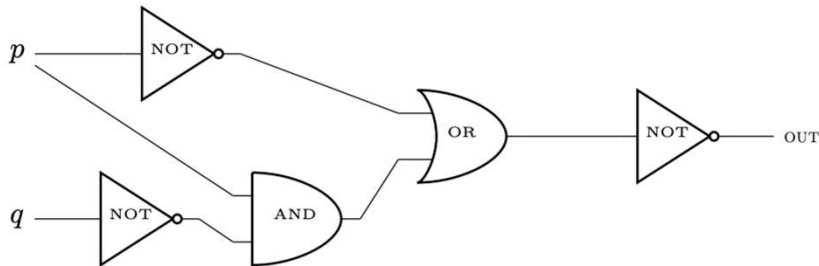
There are lots of rules with AND/OR/NOT,  
but very few with implications...

## Digital Circuits – Practice

Write  $\neg p \wedge (\neg q \wedge (r \vee s))$  as a circuit.



## Digital Circuits – Practice



**Tip:** Think of starting from the end and working back to create the expression.

## Meet Boolean Algebra

Name	Variables	"True/False"	"And"	"Or"	"Not"	Implication
Java Code	boolean b	true, false	&&		!	No special symbol
Propositional Logic	"p, q, r"	T, F	$\wedge$	$\vee$	$\neg$	$\rightarrow$
Circuits	Wires	1, 0	And	Or	Not	No special symbol
Boolean Algebra	a, b, c	1, 0	$\cdot$ ("multiplication")	$+$ ("addition")	' (apostrophe after variable)	No special symbol

Propositional logic  
 $(p \wedge q \wedge r) \vee s \vee \neg t$

Boolean Algebra  
 $pqr + s + t'$