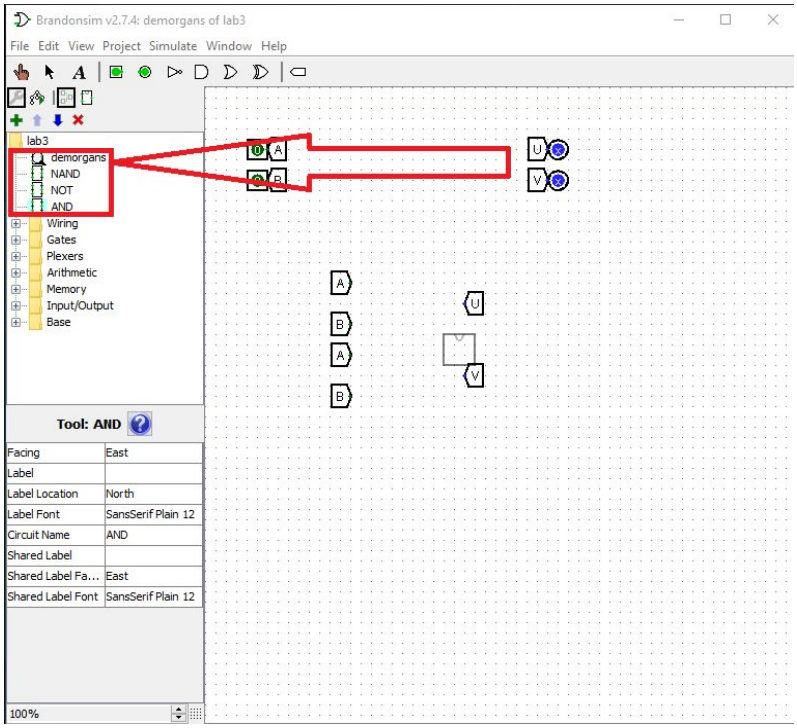
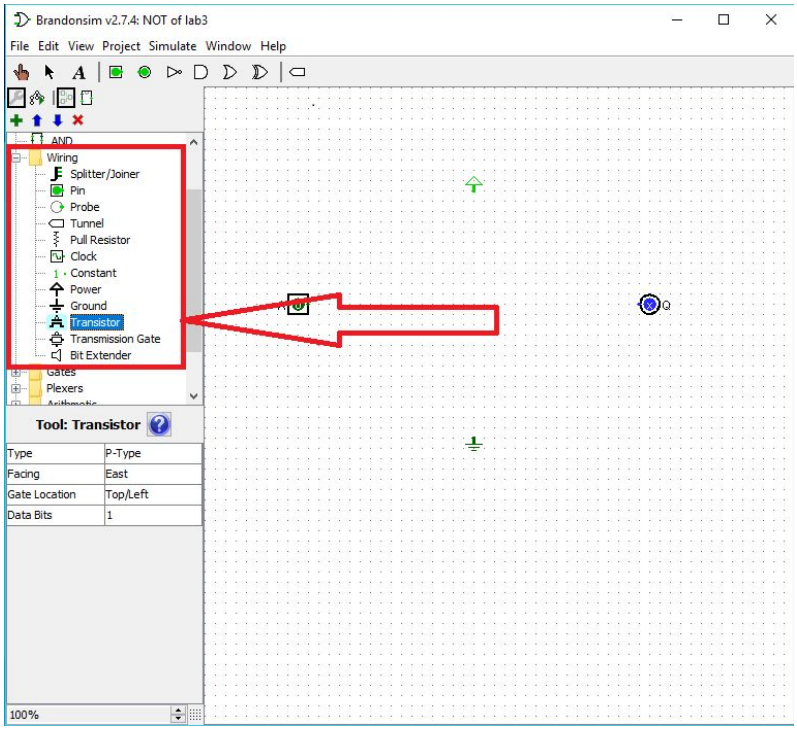
Getting started

1. Open the lab3.circ file in logisim
2. Double click the different sub-circuits in the left panel to switch between them.



3. Transistors are found under **<u>Wiring → Transistor</u>**



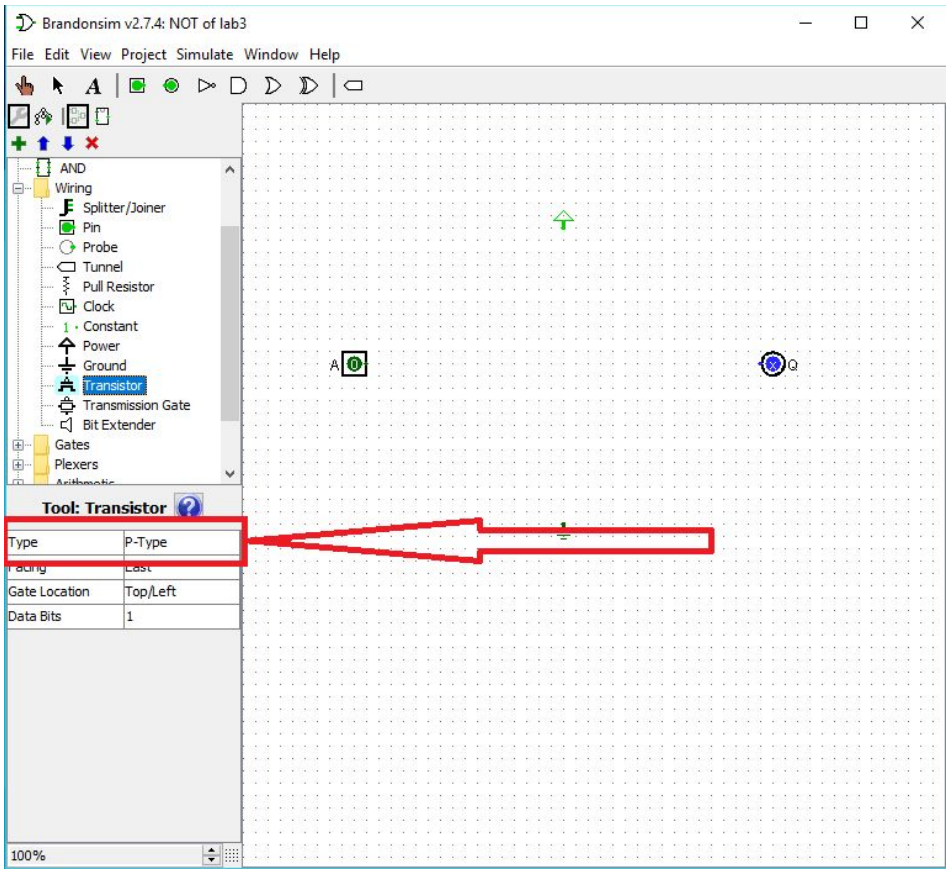
The 1 transistor rule

You must follow the following convention (no matter how frustrating)

- P-type transistors go on TOP of the diagram, connected to power
- N-type transistors go on BOTTOM, connected to ground.

Not Gate

1. Switch to the sub-circuit “NOT”
2. Complete the “NOT” subcircuit with only transistors and wires
3. You can change the type of transistor by editing the “type” field



NAND & AND

1. Complete the NAND circuit using only transistors and wires.
2. Complete the AND circuit using the previous 2 parts of this assignment.

DeMorgan’s

NOTE: You can use logic gates for this part (don’t have to use transistors)

Bill has already alluded to this in lecture (and some of you may have seen it before), but here's something cool.

There is a property of boolean logic called DeMorgan's Law that states:

"The negation of a conjunction is the disjunction of the negations."

Or, simply put,

!(A && B) == (!A || !B)

For the first part of this assignment, you will be building a simple circuit to demonstrate this principle.

In the template we have provided, fill in the missing logic gates and connect the tunnels to the inputs.

For the first gate, use an AND gate and invert the output (see the left side of the equation above).
For the second gate, use an OR gate and invert the inputs (see the right side of the equation above).

You will notice the outputs for both gates are the same.

This is DeMorgan's law in action.

When you are done with all of these circuits show them to your TAs.