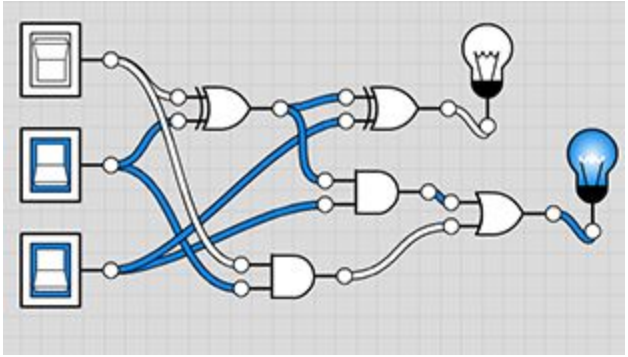
Digital Logic Activity

To start, please go to the following website:

logic.ly/demo



Task #1: Learn how Gates work.

For each of the basic gates listed below, (1) create a gate of that type, (2) create a switch for each input on the gate, (3) create a lightbulb, (4) link the pieces together. Then, use the switches to understand how the gate works.

1. AND
2. OR
3. NOT
4. XOR

Task #2: Learn how to use multiple gates.

1. Can you create an XOR gate using only AND, OR, and NOT? Explain/draw.

2. Can you create an XOR gate using only AND and NOT? Explain/draw.

3. Can you create an AND gate using only OR and NOT? Explain/draw.

Task #3. Create a “multiplexer”.

Step 1. Create a circuit that has two inputs I0 and I1, one special input S, and and one outupt O1. The output O0 copies the value of either I0 or I1, depending on whether S is on or off.

Step 2. Create a circuit that has four inputs I0,...,I3, and two special inputs S0 and S1, and one output O1. The circuit outputs one of the values of I0,...,I3, depending on the value of the BINARY NUMBER made by the digits S1,S0.

Step 3. Create larger and larger multiplexers.

Task #4. Create an “adder”.

Step 1. Create a circuit that has two inputs A and B, an output O, and a special output CO. The output O should be the digit sum of A and B (without carrying), and the special output CO should indicate whether there is a carry digit for the sum.

Step 2. Create a circuit that has two inputs A and B, a special input CI, an output O, and a special output CO. The output O should be the digit sum of I0, I1, and CI. The special ouput CO should indicate whether there is a carry digit for the given sum.

When you have finished step 2, make it into a component called Adder.

Step 3. Create a circuit that has eight inputs: A0,...,A3 and B0,...,B3, and five outputs O0,...,O4. The outputs O should be the binary sum A+B. Use your component from step 2.