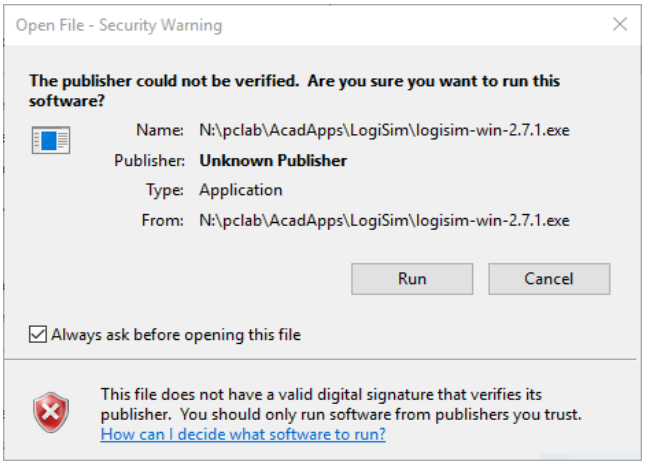
Using Logisim

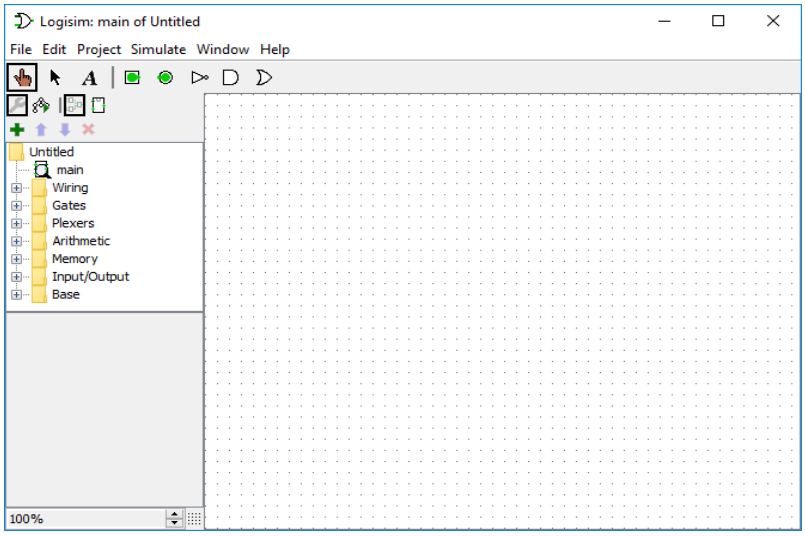
This week we will be learning a software tool called Logisim, which we can use to further explore binary logic gates and circuits. Since we want everyone to have hands-on practice with the software, you will not be working with partners for the lab this week. You may, of course, discuss things with others in the lab for assistance as you work through the tutorial and exercise.

On the lab computers, Logisim can be found in a folder called Academic Programs on the Windows Start Menu. Click on this folder, then open the LogiSim folder and you should see logisim-win-2.7.1

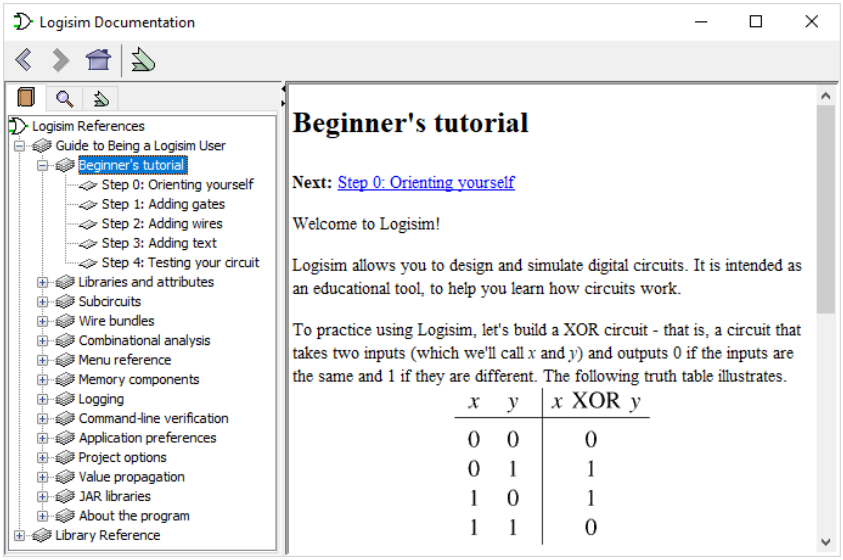
When you start Logisim, you will see a Windows Security Warning regarding an Unknown Publisher. Click on Run to continue.



You should see the window shown below once Logisim has successfully started.



Select Tutorial on the Help menu, which opens another window with a short tutorial.



Work through the steps of this tutorial, which will show you how to use Logisim to draw and test a circuit equivalent to the Boolean Exclusive OR (XOR) operation. (The XOR operation is described on the opening page of the tutorial).

Once you have completed the tutorial, you can clear the canvas to prepare for the next exercise by using the Edit tool to select everything and then pressing the Delete key. Or you can open a second, empty window with New on the File menu.

We will often try to simplify a Boolean expression algebraically before drawing a circuit diagram. For this exercise, however, we want to draw a circuit that matches the actual expression as closely as possible.

Using Logisim, draw a circuit based on the Boolean expression below. Recall that $*$ represents AND, $+$ represents OR, and $\overline{A}$ is NOT A.

$$Q = (A * B) * (A + \overline{B})$$

This circuit is logically equivalent to one of the basic logic gates you have already learned about. Use the Poke tool to try all 4 possible pairs of 0/1 inputs, and by observing the state of the output, and summarizing the output in a truth table on paper if necessary, determine which single logic gate is equivalent to this circuit.

Add your name somewhere on your circuit using the Text tool, and save the circuit in a file named `Lab8.circ` wherever you usually save your Python lab work.

Submitting your work

Once you have finished drawing the circuit and identified the equivalent logic gate, you are ready to submit your work.

Check that your file is named correctly, `lab8.circ, and u`pload your file to the Lab 8 page on Moodle.

Have one of the TAs in the lab come over and evaluate your work.

Downloading LogiSim

You can download and run Logisim on your own computer. It is not currently being maintained but should still run on current Windows and macOS computers. A link to the download site has been added to the Lab Software Installation Notes on Moodle.