Logisim Homework - Some things to know about Logisim

DO NOT MODIFY ANY SETTINGS YOU DO NOT UNDERSTAND. SOME OF THEM CAN BREAK YOUR CIRCUIT.

Do not try to use the "Edit Circuit Appearance" option. It will cause the tests to fail.

Position, orientation, and naming of the pins is important. In all the following homework assignments, MAKE SURE TO FOLLOW THE GIVEN PIN LAYOUT EXACTLY.

ALL input pins MUST be facing east.

ALL output pins MUST be facing west.

The order from top to bottom must be EXACTLY as shown below.

ALL labels must be exactly as shown. Do not use spaces in your label names.

You are only allowed to use the components listed on each assignment. Using anything else will cause the tests to fail.

Part 1 – 3x8 Decoder

Create a 3 to 8 decoder in Logisim.

All labels should be exactly as shown below. Note no spaces in any input or output pin label.
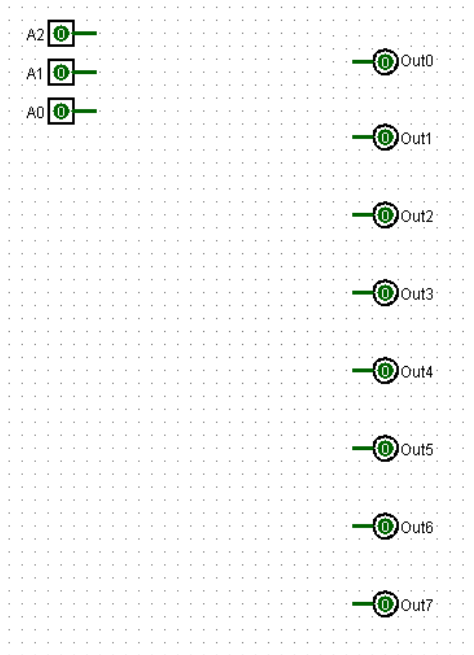
Create the decoder.

> Connect eight, 3-input and gates to each output.

> Connect the output of inverters to the inputs of the AND gates as needed.

> Connect the input pins to inverters or the AND gate as needed.

You are only allowed to use the following components for this portion:

> Pins, And Gates, Or Gates. Don't use inverters use negated inputs on your And gates as shown in class
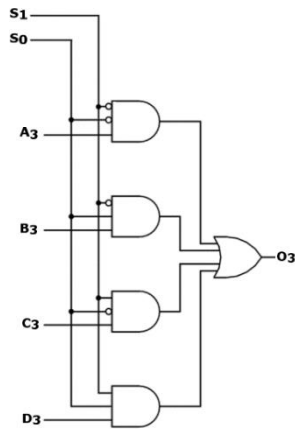
Name your file 3to8_decoder.circ.

Check the appearance of your circuit before uploading. Instructions are at the end of this document.
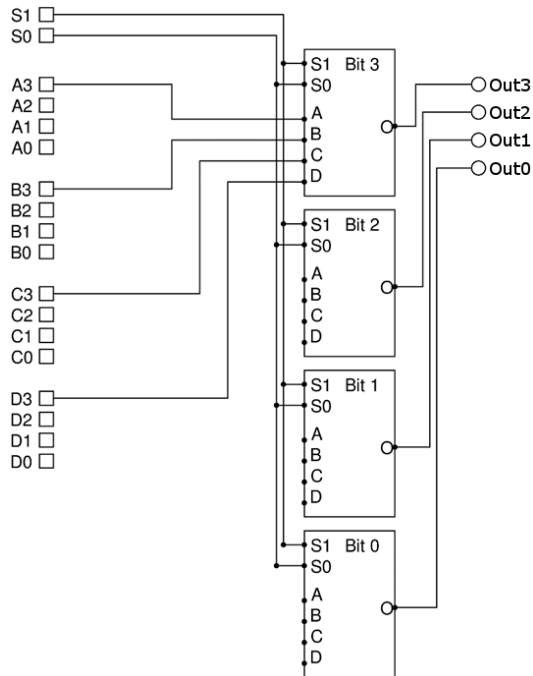
Submit to Web-CAT to the appropriate part when done.

Part 2 – 16x4 Multiplexer

The following image shows **one stage** a 4x1 multiplexor. Create this circuit in Logisim.

The following image is a block diagram of the entire 16x4 multiplexer.

Make sure your input and output pins match figure 2 exactly. Only input and output pins matter. You don't need to label the block diagrams.

Note that figure 1 is ONE of the blocks shown as block diagrams Bit 3, Bit 2, Bit 1, and Bit 0 on the block diagram to the right. All you need to do is copy and paste the single stage four times and make appropriate connections.

Only the Bit 3 connections are shown. You must also connect the A2, B2, C2, and D2 inputs to the Bit 2 stage. Then you must repeat for the Bit 1 stage and the Bit 0 stage.

You are only allowed to use the following components for this portion: Pins, And Gates, Or Gates. Don't use inverters. Use negated inputs as shown in class.
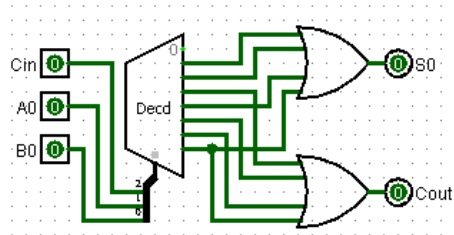
Name your file 16x4_mux.circ

Check the appearance of your circuit before uploading. Instructions are at the end of this document.

Submit to Web-CAT to the appropriate part when done.

Part 3 – Four-bit Adder

This is a single stage of an addition circuit created in Logisim.

Create the above circuit in Logisim. NOTE THE PIN NUMBERS ON THE SPLITTER.

Your assignment is to create a four-bit adder by duplicating and connecting the different stages of single bit addition circuits.

This is an example of adding two different four-bit numbers. One stage is highlighted in blue below.

```
  1  1  1  0   <-Carry
  0  1  1  1      A=7
+ 0  0  1  1      B=3
───────────────
  1  0  1  0      S=10
```

Copy and paste the single stage 4 times. You will need one stage for each column of a four-bit addition.

Create three more input pins for A (For a total of four: A0, A1, A2, and A3).

Create three more input pins for B (For a total of four: B0, B1, B2, and B3).

YOU MUST change the first Cin pin to a constant.

The input pin layout is positional. That is, from top to bottom, your pins must be in EXACTLY the arrangement shown in the following image.

A0 MUST be on top. A1 MUST be below A0. A2 MUST be below A1. A3 MUST be below A2.

Pins for B must be exactly in this order and below the pins for A.

Make sure to change the output pins so that you have S0, S1, S2, and S3 on subsequent stages as shown in the following image.
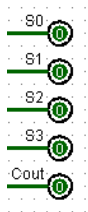
S0, S1, S2, S3, and Cout must be in that order top to bottom on the right.

THERE SHOULD BE NO EXTERNAL PINS FOR INTERNAL CONNECTIONS (i.e. this circuit should have exactly ONE Cin and exactly ONE Cout pin as shown on the block diagram below.
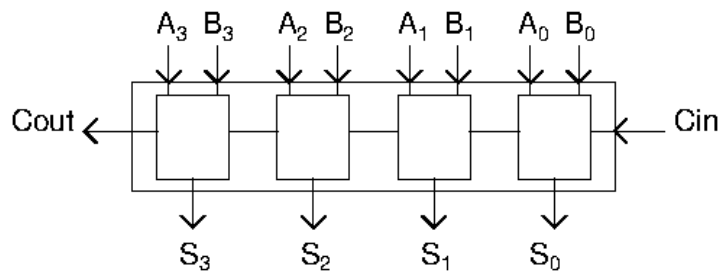
Four Bit Adder

You are only allowed to use the following components for this portion:

　　　　Pins, Decoders, Constants, Or Gates, and Splitters.

Name your file four_bit_adder.circ.

Check the appearance of your circuit before uploading. Instructions are at the end of this document.

Submit to Web-CAT to the appropriate part when done.

CHECK YOUR CIRCUIT APPEARANCE BEFORE UPLOADING TO WEB-CAT!

Click on Project->Edit Circuit Appearance and you should see something like this with orderly square input pins on the left side of the image and orderly round output pins on the right side of the image. There may be more or fewer pins than shown depending on the assignment.

DO NOT MODIFY ANYTHING IN THIS VIEW!!!
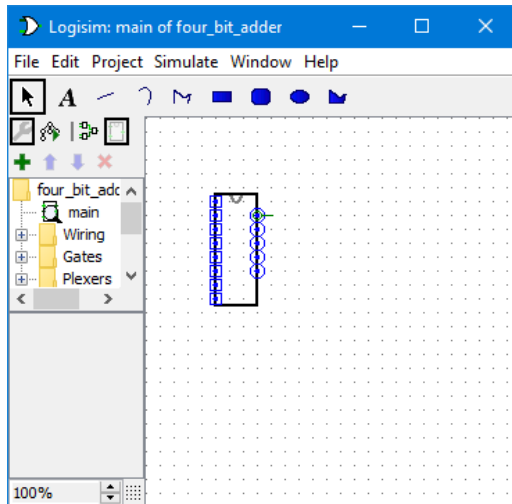
If you see a jumbled mess of pins will fail the tests on Web-CAT.

Here is an example of a bad circuit appearance.