

## Homework 8: Simulated Adder

Your assignment is to create a functional 8-bit ripple-carry adder/subtractor in Logisim. The file you turn in should be called `adder.circ`. It will do the following:

- Take two 8-bit integers as input on the west side.
- Also take a control input bit on the north side, that is 0/false for addition and 1/true for subtraction.
- Output their sum or difference as an 8-bit integer on the east side.
- Also output a 1-bit overflow flag on the east side, that will output 1/true if the sum overflowed and 0/false if not, using signed-arithmetic rules.
- You may not use any tools in Logisim's *Arithmetic* menu for this assignment.

Start by downloading the pre-made circuit for this assignment, `dummy-adder.circ`. This adder uses Logisim's built-in adder for the addition, which always adds and uses unsigned rules for overflow. You will make a brand new circuit to go in its place, that meets the above specifications. When finished, you should be able to just delete the old circuit (labeled "Your chip goes here") and drag yours into its place.

The best way to do this is to start by creating a single-bit full-adder circuit, and then use 8 of these as part of the ripple-carry adder.

For overflow, there are two tacks you can take. You can test the sign bits as we have done before (i.e. testing if 2 positives add to a negative, or 2 negatives add to a positive), or you can simply XOR the carry-in and carry-out of the most significant full-adder.

