This homework assignment requires to design a 32-bit full adder that can perform 32-bit addition and subtraction by using the Logisom Simulator.

Its internal implementation can be designed using a 32 ripple carry full adders. The inputs A and B to this full adder include two 32-bit integers and a control signal ADD/SUB, and the output F is A+B or A-B. The control signal, ADD/SUB, is used to determine whether the operation to be performed is addition or subtraction. If this signal is 0, the adder will perform addition, otherwise it will perform subtraction. The subtraction is performed using 2's complement representation as A – B = A + B' + 1. B' is B’s complement.

The adder also generates Carry-Out (Cout) and Overflow signal that can be used to test for comparison purposes for unsigned and signed operations and for correctness of the obtained result. The overflow signal can be generated by XORing the carry-outs of bits 30 and 31.