United International University
QUEST FOR EXCELLENCE

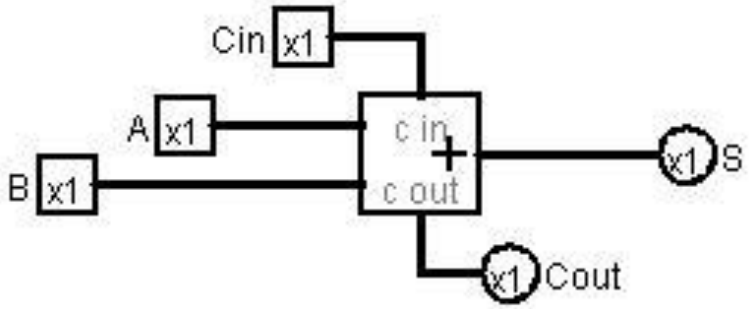

# CSE 1326: Digital Logic Design Lab
# Implementing Full Adder

## United International University

# What to do

- (1) Implement a 1-bit full-adder using XOR gates.

| Cin | A | B | Cout | S |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 1 | 1 |




- $C_{in}$ is X
- A is Y
- B is Z

$$S = \overline{X}\overline{Y}Z + \overline{X}Y\overline{Z} + X\overline{Y}\overline{Z} + XYZ$$

$$C = XY + XZ + YZ$$

# What to do (contd.)

- First, simulate a one-bit Full-Adder (FA) in logisim using “adder”. Get the truth table. Find expressions for S and Cout

- Previous equations can be transformed to the following forms:

$$S = (X \oplus Y) \oplus Z$$

$$C = XY + Z(X \oplus Y)$$

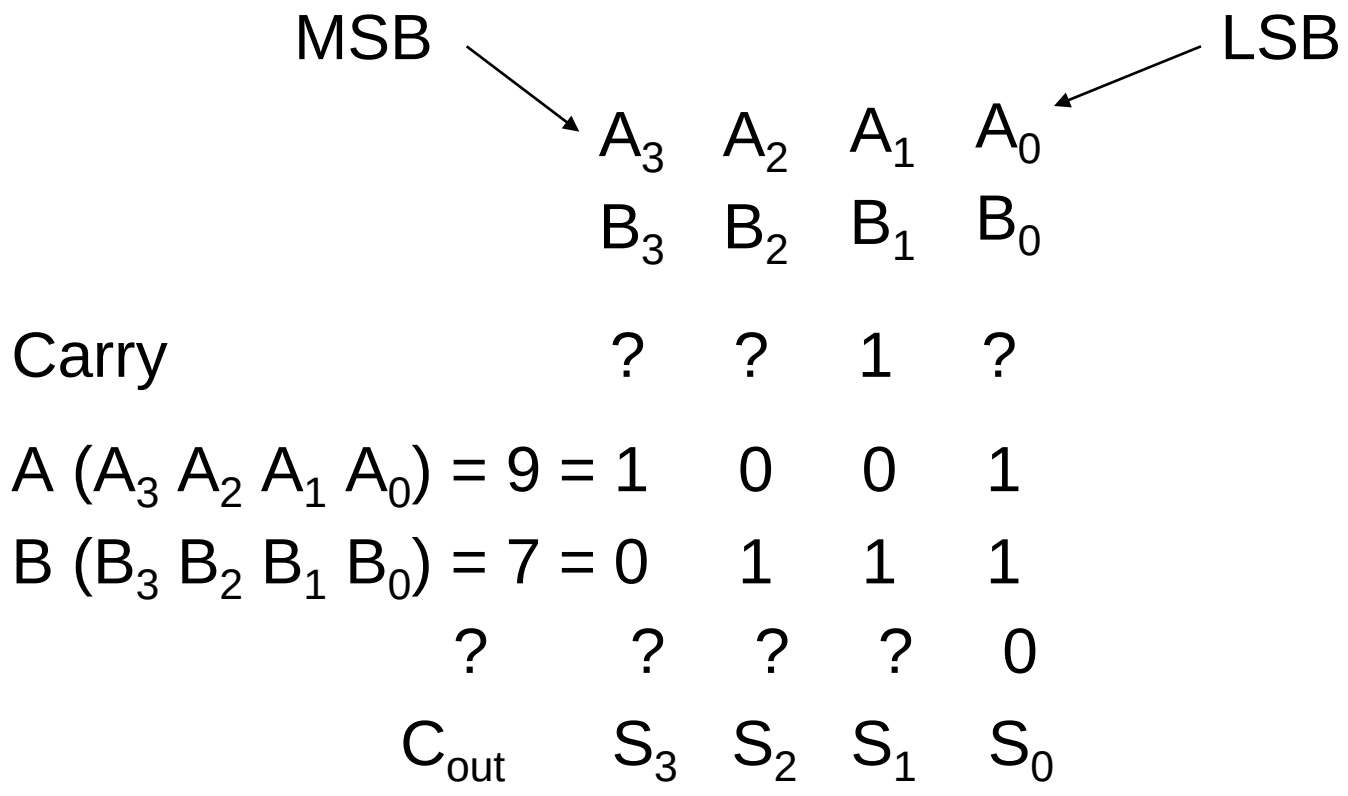
- Implement 1-bit FA using xor and verify it in both logisim and trainer-board

# What to do (contd.)

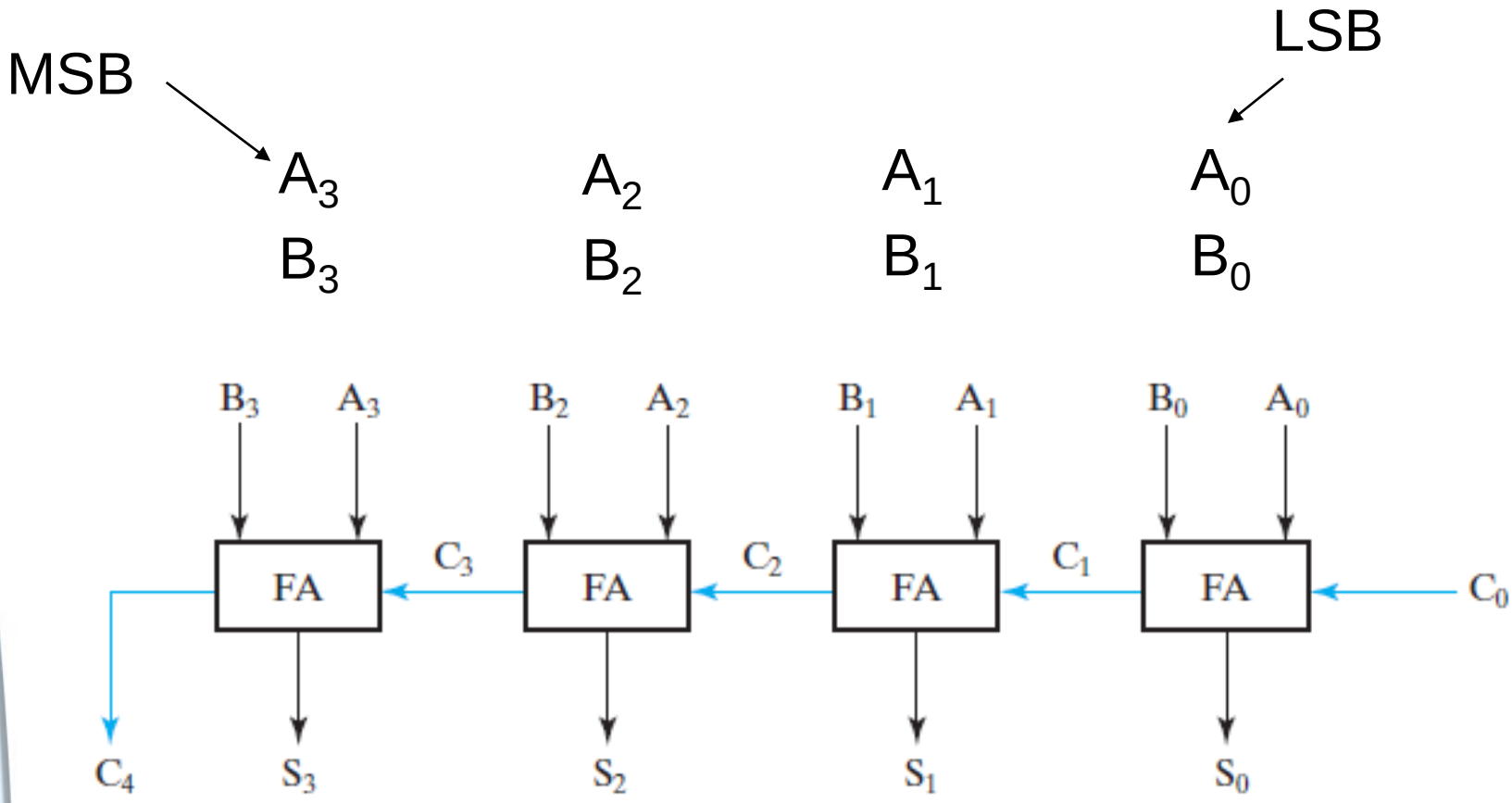
- (2) In Logisim (only), add two digits (e.g., 8 and 9) using

  a) Four 1-bit full adders
  b) Two 2-bit full adders
  c) One 4-bit full adder

# Add Two Digits (Supplementary)



# Add Two Digits (Supplementary)




- $C_{in}$ or $C_0$ is provided in LSB stage

# Writing Report

- The report should contain
  - Truth table for 1-bit full adder
  - Circuit diagram of 1-bit full adder using XOR (S and Cout)
  - Logisim circuit designs for adding two digits that uses
    - 4 1-bit full adders
    - 2 2-bit full adders
    - 1 4-bit full adder