CS 315 Combinational Logic

Midterm

Digital Design

Digital - splitters, sub circuits

Autograder

Midterm

High	100
Low	25
Avg	74

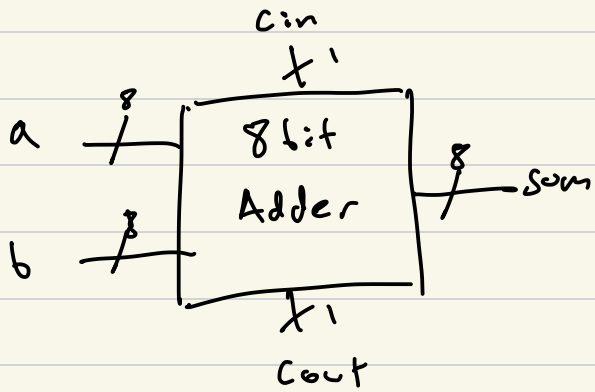
Final

Do better

$$\text{Midterm}_{\text{new}} = \frac{\text{Final} + \text{Midterm}_{\text{old}}}{2}$$

Final 90 Midterm 70

$\text{Midterm}_{\text{new}} = 80$



Ripple Carry Adder

Sum-of-products

A new function

3-bit number $n_2 n_1 n_0$ (bits)

Two 1-bit outputs: even odd

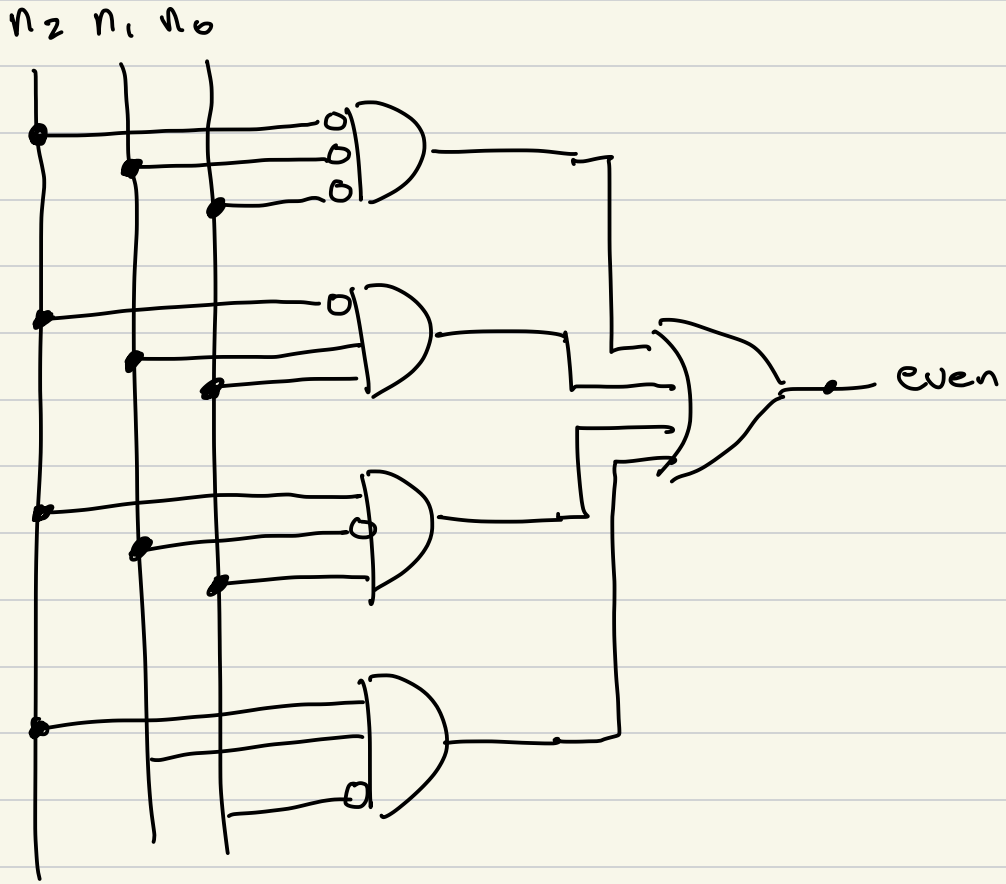
Goal: determine if the number of "1" bits are even or odd

110	even
111	odd
100	odd

	n_2	n_1	n_0	even	odd
①	0	0	0	1	0
	0	0	1	0	1
	0	1	0	0	1
②	0	1	1	1	0
	1	0	0	0	1
③	1	0	1	1	0
④	1	1	0	1	0
	1	1	1	0	1

$$even = (\bar{n}_2 \cdot \bar{n}_1 \cdot \bar{n}_0) + (\bar{n}_2 \cdot n_1 \cdot n_0) + (n_2 \cdot \bar{n}_1 \cdot n_0) + (n_2 \cdot n_1 \cdot \bar{n}_0)$$

$$odd = \overline{even}$$



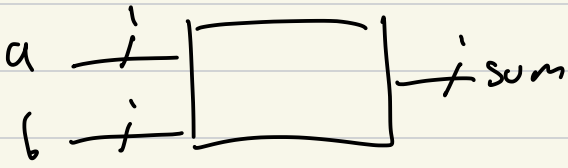
Lab 05 Part 2 max 2

$a_1 a_0$ $b_1 b_0$	$r_1 r_0$
⋮	
1 0 0 1	1 0
⋮	

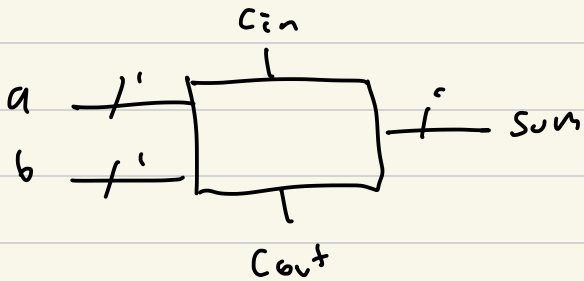
$r_1 =$

$r_0 =$

1 bit full adder

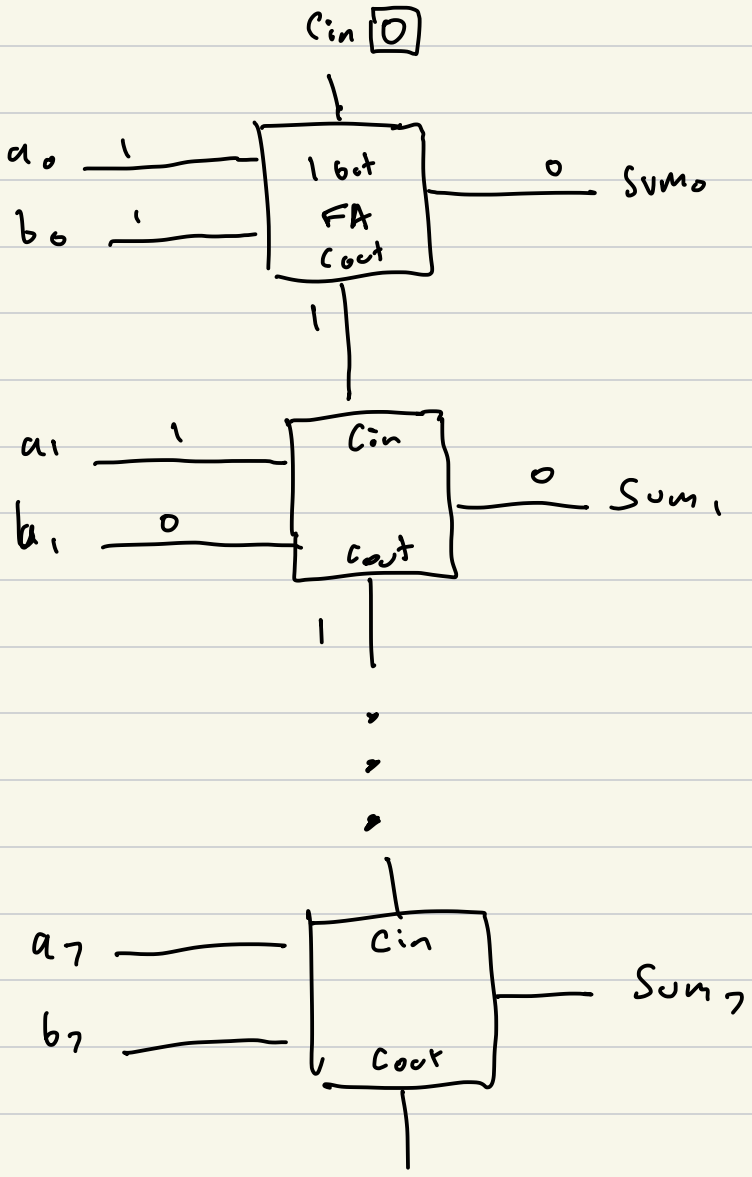


half adder

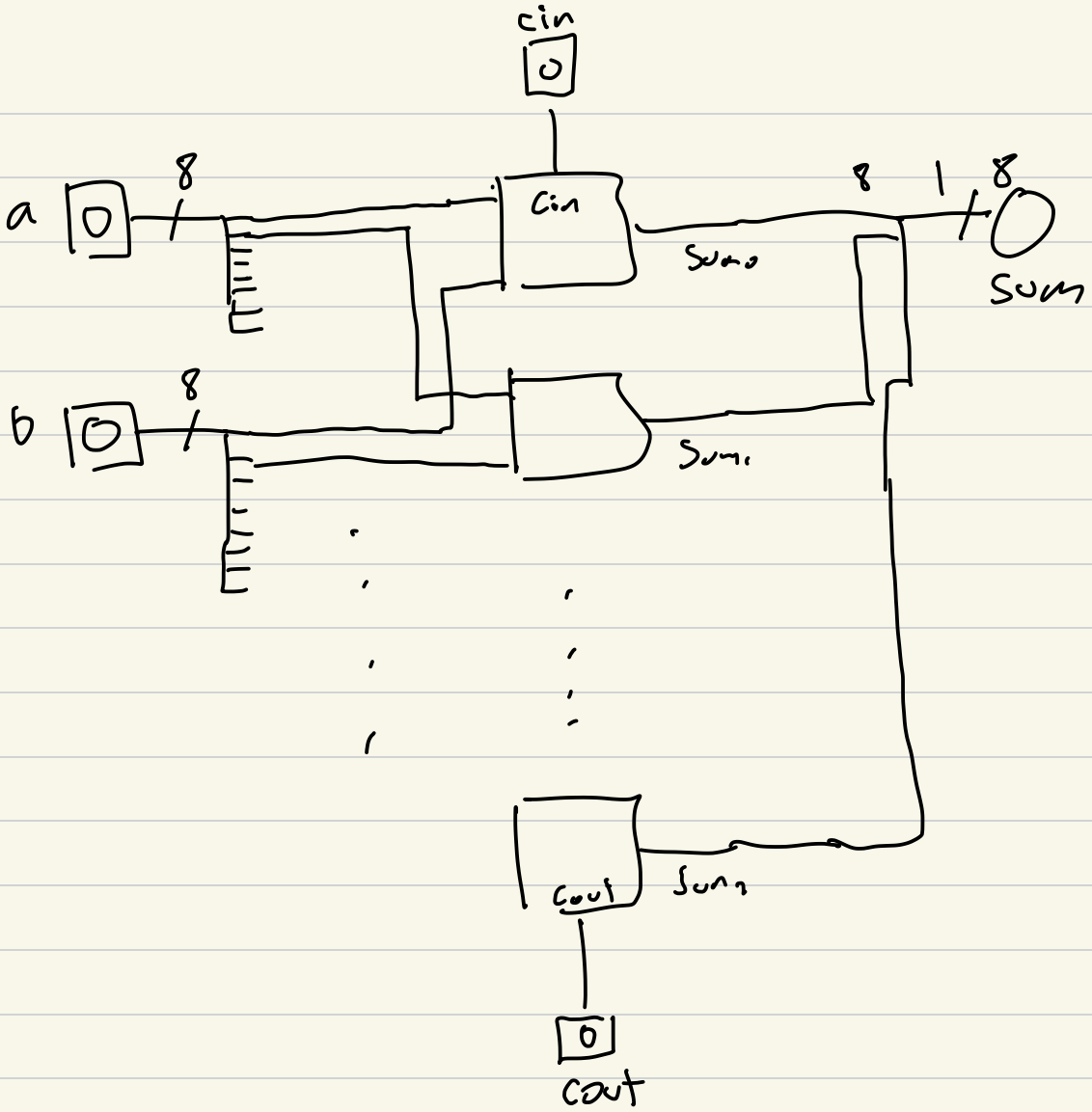


full adder

8 bit ripple-carry adder

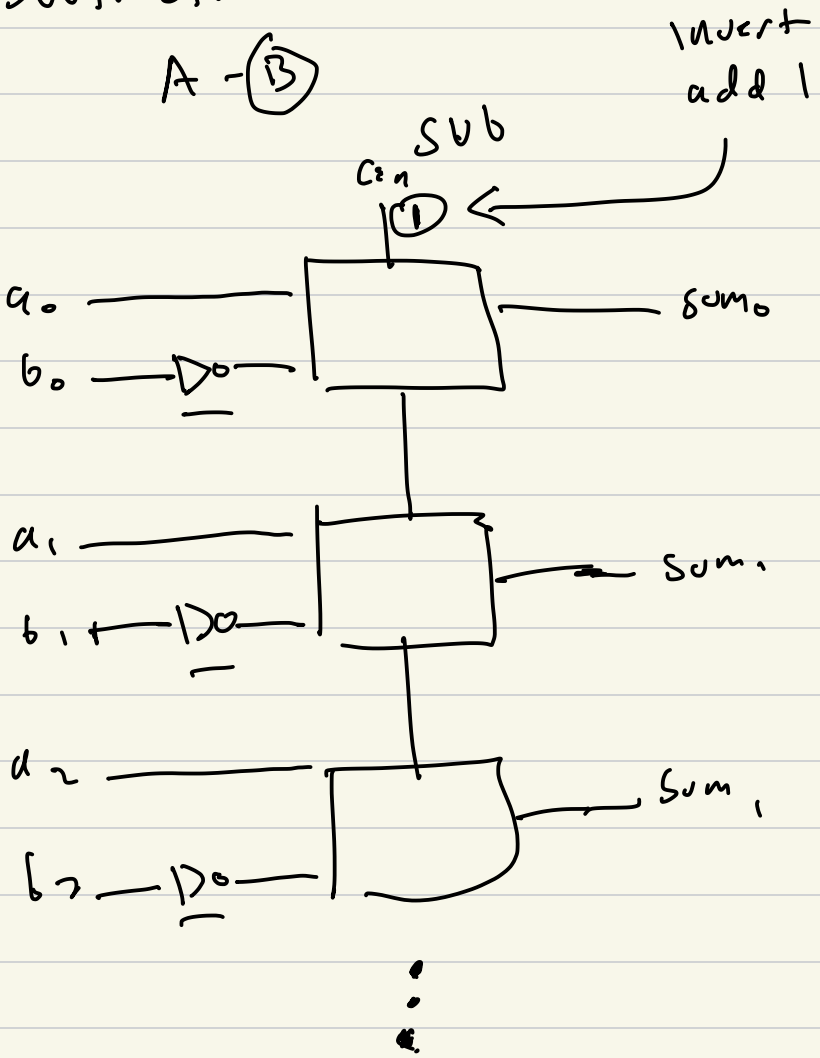



```
  1
  0 1 1  a
+ 0 0 1  b
---------
    0
```


cin
a
8
cin
8
1
8
Sum0
Sum
b
8
Sum1
Sum7
Cout
Cout

Subtraction

A - B

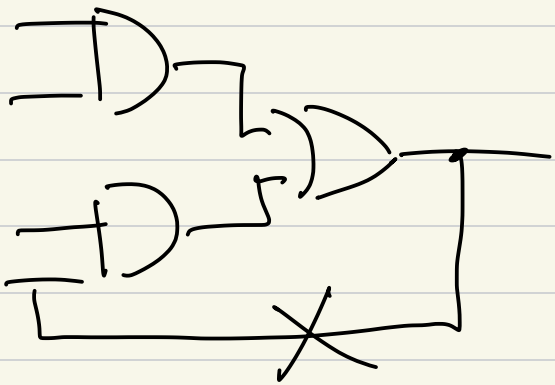


Combinational Logic

→ components

Multiplexer

Decoders

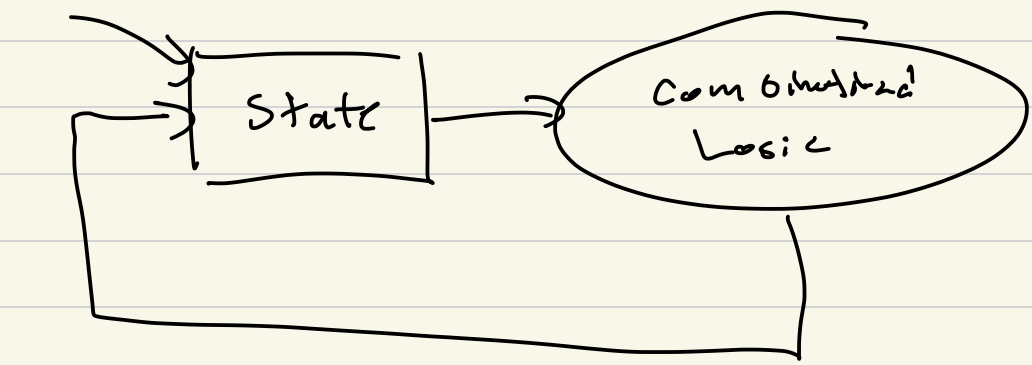


No cycles

Sequential Logic

State

CLOCK



CPU

Autograder on Local Computer (not RISC-V)

autograder

python3

pip3

java javac