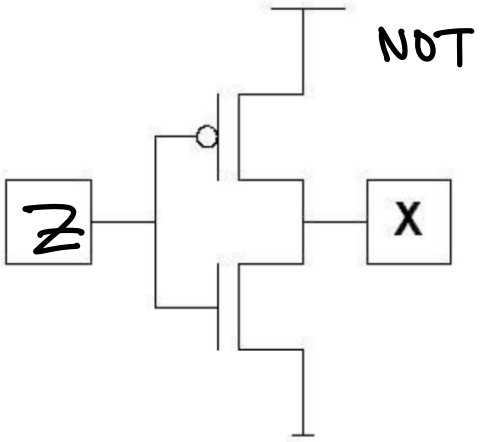
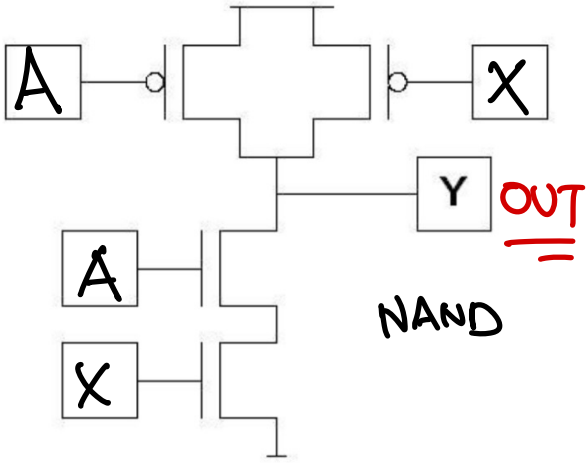
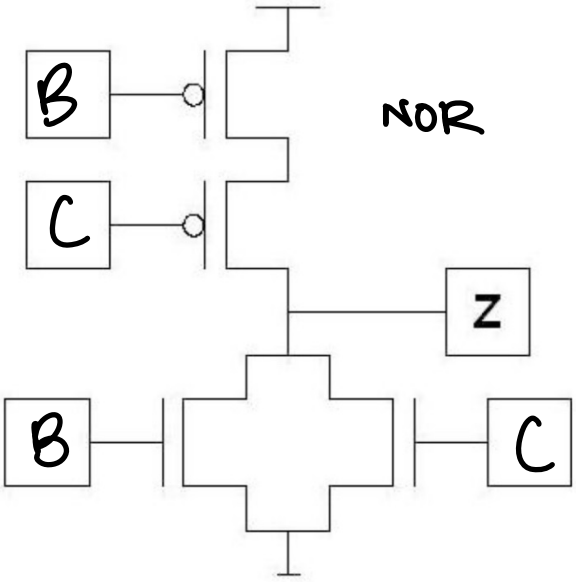
1







NOT('A AND (B OR C)')

A NAND (B OR C)

A NAND NOT(B NOR C)

$A'B' + A'B + AB'$

$A' + AB'$

(2)

$(A'B'C')' = A + B + C$

3-input OR gate

Demorgans Law

③

$2^5 = 32$

2^n

$\lceil \log_2 9 \rceil$

$\lceil \log_2 n \rceil$

(4)

A	B	C	D	out
0	0	0	0	0
0	0	0	1	1
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	1
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

outputs of 1 have inputs that sum to 1 or 3.

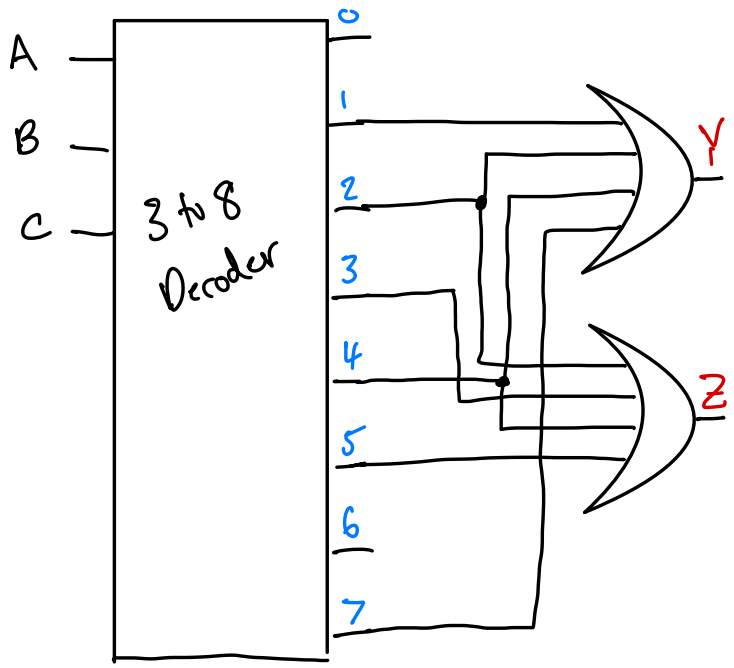
outputs of 0 have inputs that sum to 2.

5

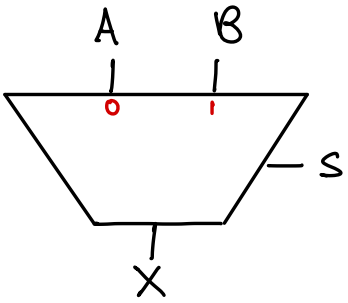
	A	B	C	Y	Z
0	0	0	0	0	0
1	0	0	1	1	0
2	0	1	0	1	1
3	0	1	1	0	1
4	1	0	0	1	1
5	1	0	1	0	1
6	1	1	0	0	0
7	1	1	1	1	0

$Y = A'B'C + A'BC' + AB'C' + ABC$

$Z = A'BC' + A'BC + AB'C' + AB'C$



6



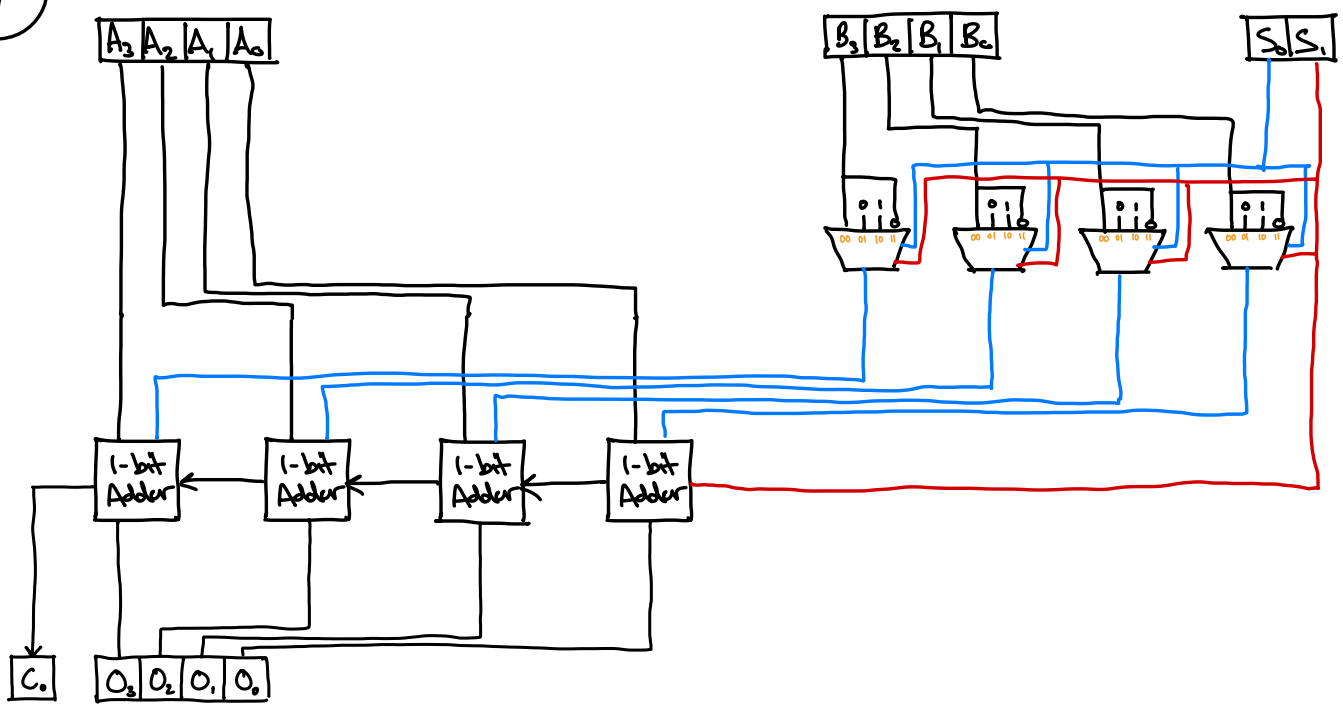
A	B	S	X
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

$$X = A'BS + AB'S' + ABS' + ABS$$

$$BS(A' + A) + AS'(B' + B)$$

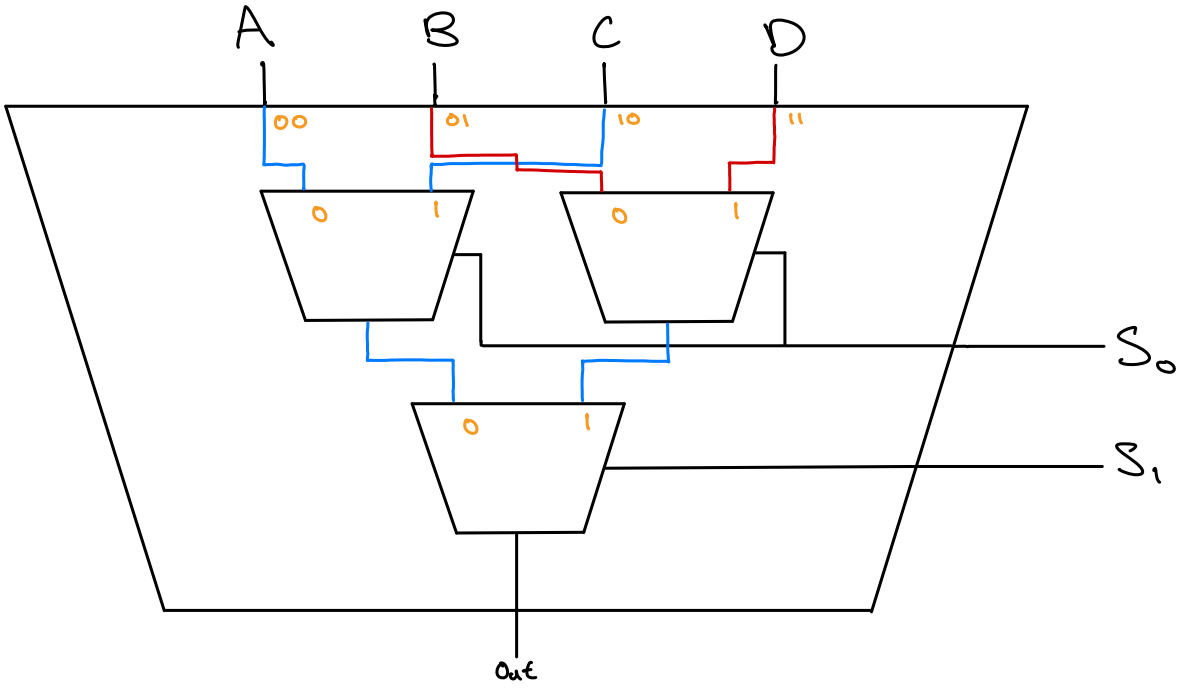
$$BS + AS'$$

7

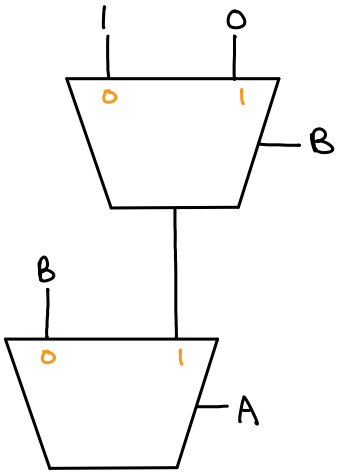

A3 A2 A1 A0
B3 B2 B1 B0
S0 S1
1-bit Adder
1-bit Adder
1-bit Adder
1-bit Adder
C0
O3 O2 O1 O0

8

a)



b)



A	B		XOR
0	0	→	0
0	1	→	1
1	0	→	1
1	1	→	0