Single or Call

Design of a Full Adder (1 bit)

Step 1: Generate truth table

With 3 inputs, we have 8 different Combination...

Inputs: A, B, C_{in} — Outputs: S, Cout

	Inputs			Outputs	
	A	B	C_{IN}	S	Cout
1	0	0	0	0	0
2	0	0	1	1	0
3	0	1	0	1	0
4	0	1	1	0	1
5	1	0	0	1	0
6	1	0	1	0	1
7	1	1	0	0	1
8	1	1	1	1	1

Binary 10b

1
1

10b

A = 1, B = 0
C_{IN} = 0

Binary

0 1
0 0

1

15
12

7

Step 2: Determine the logical Expression

$$S = \bar{A}\bar{B}C_{IN} + \bar{A}B\bar{C}_{IN} + A\bar{B}\bar{C}_{IN} + ABC_{IN}$$

$$Cout = \bar{A}BC_{in} + A\bar{B}C_{IN} + AB\bar{C}_{IN} + ABC_{IN}$$

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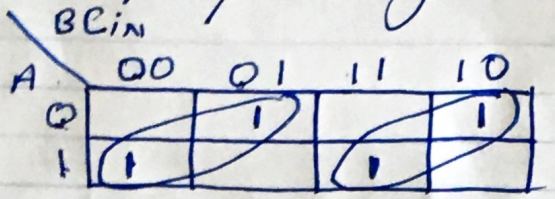
Step 3. Simplify Equation or logical Expression

$$S = \bar{A}\bar{B}C_{IN} + \bar{A}B\bar{C}_{IN} + A\bar{B}\bar{C}_{IN} + ABC_{IN}$$

$$= A \oplus B \oplus C_{IN}$$

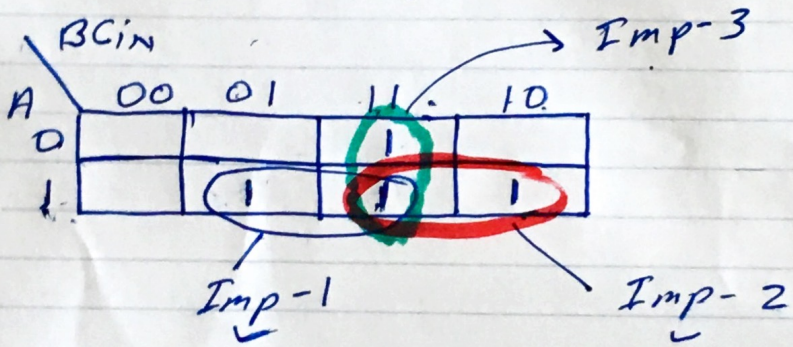
Simplify Using K-Map



$$C_{out} = \bar{A}BC_{IN} + A\bar{B}C_{IN} + AB\bar{C}_{IN} + ABC_{IN}$$

$$= AC_{IN} + AB + BC_{IN}$$

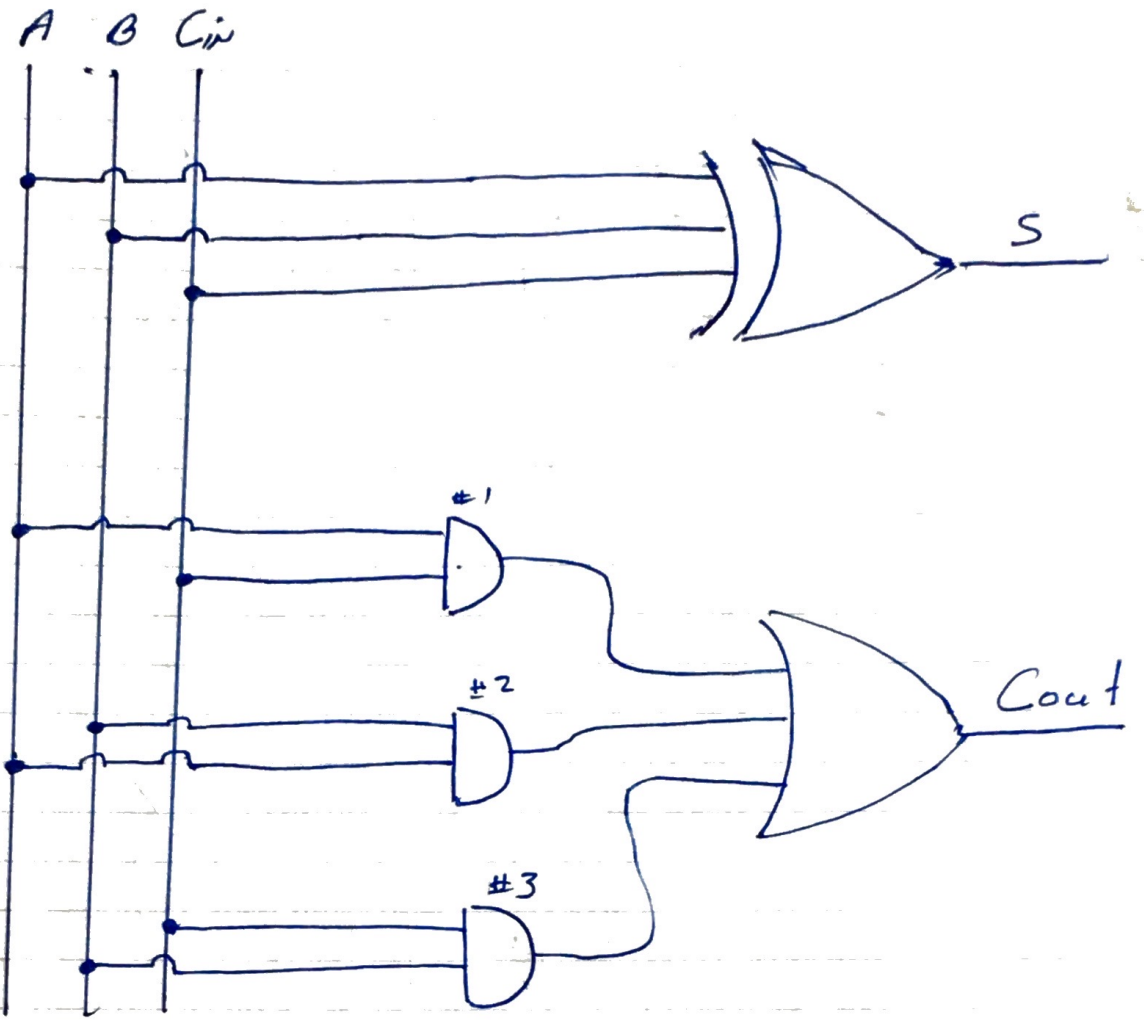
Simplify Using K-Map



Design of A Full Adder (1 bit)

Step 4: Design of the Circuit

- $S = A \oplus B \oplus C_{IN}$
- $C_{out} = \underbrace{AC_{IN}}_{\text{AND1}} + \underbrace{AB}_{\text{AND2}} + \underbrace{BC_{IN}}_{\text{AND3}}$

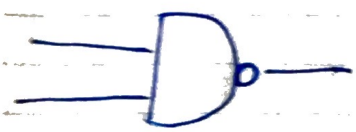


Configured NAND

Inverter

X	X	Y
0	0	1
1	1	0

X	Y
0	1
1	0



Extra Notes