

1a. Generate the truth table

A	B	C _i	Sum	Count
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

1b. K-maps for the Sum and Count

Sum	$\bar{B}\bar{C}_i$	$\bar{B}C_i$	BC_i	$B\bar{C}_i$	Count	$\bar{B}\bar{C}_i$	$\bar{B}C_i$	BC_i	$B\bar{C}_i$
\bar{A}	0	1	0	1	\bar{A}	0	0	1	0
A	1	0	1	0	A	0	1	1	1

$$\text{Sum} = \bar{A}\bar{B}\bar{C}_i + \bar{A}\bar{B}C_i + \bar{A}BC_i + \bar{A}B\bar{C}_i$$

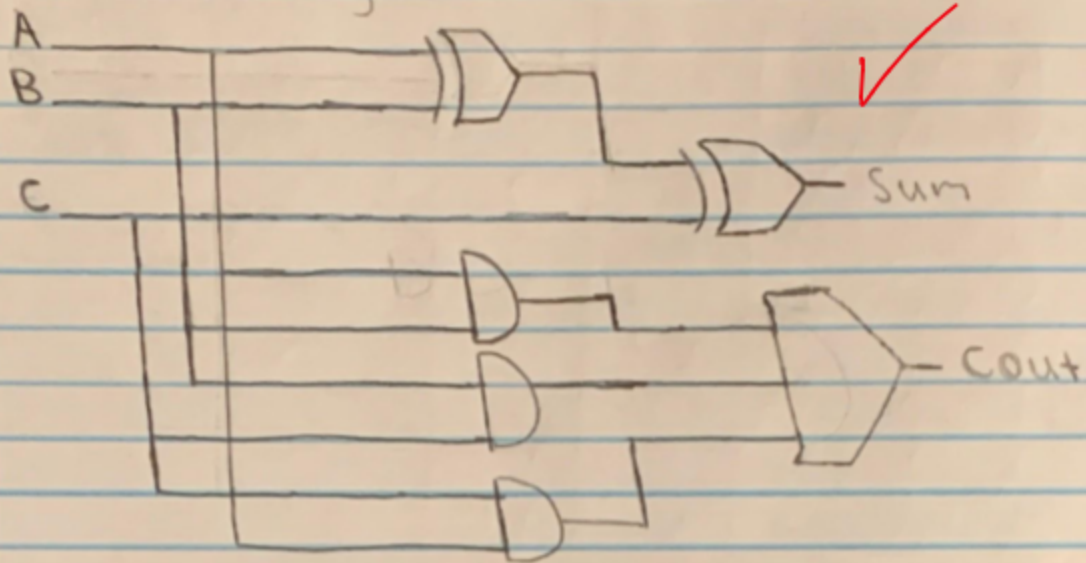
$$\text{Sum} = \bar{A}(\bar{B}\bar{C}_i + \bar{B}C_i + BC_i + B\bar{C}_i)$$

$$\text{Sum} = \bar{A}(B \oplus C) + A(B \oplus C)$$

$$\text{Sum} = A \oplus B \oplus C$$

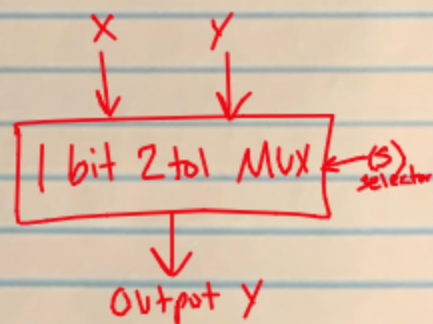
$$\text{Count} = BC_i + AB + AC$$

Schematic diagram



2a. Generate Truth table

S	I ₁	I ₀	Y
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1



2b. K-map for the output Y

Y \	\bar{I}_1, \bar{I}_0	\bar{I}_1, I_0	I_1, I_0	I_1, \bar{I}_0
\bar{S}	0	1	1	0
S	0	0	1	1

Output expression for Y is $Y = \bar{S}I_0 + SI_1$

ZC. Schematic diagram :-

