TABLE 2

x	y	z	xy	$\bar{z}$	$F(x, y, z) = xy + \bar{z}$
1	1	1	1	0	1
1	1	0	1	1	1
1	0	1	0	0	0
1	0	0	0	1	1
0	1	1	0	0	0
0	1	0	0	1	1
0	0	1	0	0	0
0	0	0	0	1	1

TABLE 5 Boolean Identities.

Identity	*Name*
$\bar{\bar{x}} = x$	Law of the double complement
$x + x = x$ $x \cdot x = x$	Idempotent laws
$x + 0 = x$ $x \cdot 1 = x$	Identity laws
$x + 1 = 1$ $x \cdot 0 = 0$	Domination laws
$x + y = y + x$ $xy = yx$	Commutative laws
$x + (y + z) = (x + y) + z$ $x(yz) = (xy)z$	Associative laws
$x + yz = (x + y)(x + z)$ $x(y + z) = xy + xz$	Distributive laws
$\overline{(xy)} = \bar{x} + \bar{y}$ $\overline{(x + y)} = \bar{x}\,\bar{y}$	De Morgan's laws
$x + xy = x$ $x(x + y) = x$	Absorption laws
$x + \bar{x} = 1$	Unit property
$x\bar{x} = 0$	Zero property

A *Boolean algebra* is a set B with two binary operations $\vee$ and $\wedge$, elements 0 and 1, and a unary operation $^{-}$ such that these properties hold for all x, y, and z in B:

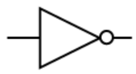
$$\left.\begin{array}{l} x \vee 0 = x \\ x \wedge 1 = x \end{array}\right\} \quad \text{Identity laws}$$

$$\left.\begin{array}{l} x \vee \bar{x} = 1 \\ x \wedge \bar{x} = 0 \end{array}\right\} \quad \text{Complement laws}$$

$$\left.\begin{array}{l} (x \vee y) \vee z = x \vee (y \vee z) \\ (x \wedge y) \wedge z = x \wedge (y \wedge z) \end{array}\right\} \quad \text{Associative laws}$$

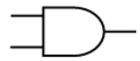
$$\left.\begin{array}{l} x \vee y = y \vee x \\ x \wedge y = y \wedge x \end{array}\right\} \quad \text{Commutative laws}$$

$$\left.\begin{array}{l} x \vee (y \wedge z) = (x \vee y) \wedge (x \vee z) \\ x \wedge (y \vee z) = (x \wedge y) \vee (x \wedge z) \end{array}\right\} \quad \text{Distributive laws}$$



NOT

Input	Output
I	F
0	1
1	0

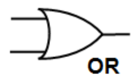


AND

Inputs		Output
A	B	F
0	0	0
1	0	0
0	1	0
1	1	1

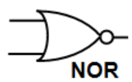
NAND

Inputs		Output
A	B	F
0	0	1
1	0	1
0	1	1
1	1	0



OR

Inputs		Output
A	B	F
0	0	0
1	0	1
0	1	1
1	1	1



NOR

Inputs		Output
A	B	F
0	0	1
1	0	0
0	1	0
1	1	0

Inputs		Output
A	B	F
0	0	0
0	1	1
1	0	1
1	1	0

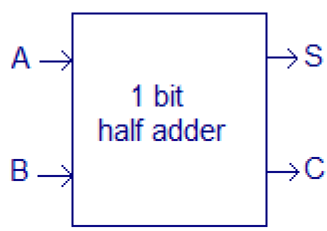
EXCLUSIVE OR

EXCLUSIVE NOR

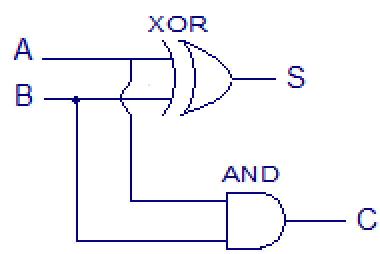
Inputs		Output
A	B	F
0	0	1
0	1	0
1	0	0
1	1	1

Inputs		Outputs	
A	B	S	C
0	0	0	0
1	0	1	0
0	1	1	0
1	1	0	1

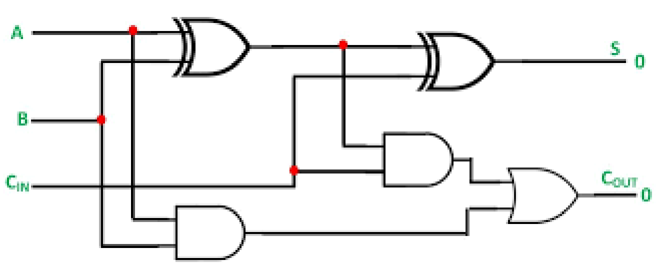
Truth table



Schematic



Realization



Input			Output	
A	B	Cin	Sum	Carry
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

Inputs					Outputs				
	A	B	C	D	W	X	Y	Z	
0×0	0	0	0	0	0	0	0	0	0
0×1	0	0	0	1	0	0	0	0	0
0×2	0	0	1	0	0	0	0	0	0
0×3	0	0	1	1	0	0	0	0	0
1×0	0	1	0	0	0	0	0	0	0
1×1	0	1	0	1	0	0	0	1	1
1×2	0	1	1	0	0	0	1	0	2
1×3	0	1	1	1	0	0	1	1	3
2×0	1	0	0	0	0	0	0	0	0
2×1	1	0	0	1	0	0	1	0	2
2×2	1	0	1	0	0	1	0	0	4
2×3	1	0	1	1	0	1	1	0	6
3×0	1	1	0	0	0	0	0	0	0
3×1	1	1	0	1	0	0	1	1	3
3×2	1	1	1	0	0	1	1	0	6
3x3	1	1	1	1	1	0	0	1	9