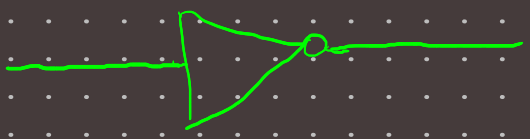
The Inverter

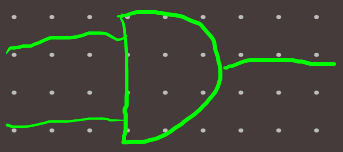
The inverter (NOT circuit) performs the operation called inversion or complementation.



In	Out
0	1
1	0

The AND Gate

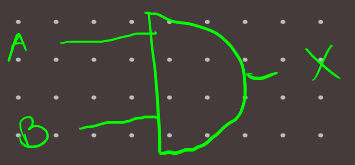
An AND gate produces a HIGH output only when all the inputs are HIGH. When any of the inputs are LOW, the output is LOW.



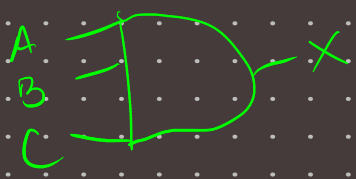
A	B	X
0	0	0
0	1	0
1	0	0
1	1	1

Logic Expressions for an AND gate

The logical AND function of two variables is represented mathematically either by placing a dot between the two variables, as A . B, or by simply writing the adjacent letters without the dot, as AB.



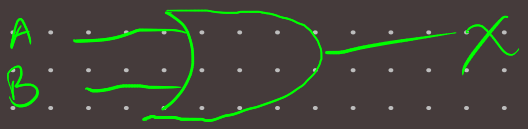
$X = AB$



$X = ABC$

The OR Gate

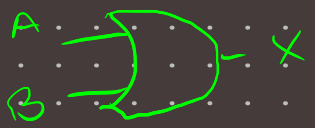
An OR gate produces a HIGH on the output when any of the inputs is HIGH. The output is LOW only when all the inputs are LOW.



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

Logic Expressions for an OR gate

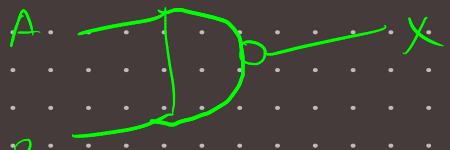
the logical OR function of two variables is represented mathematically by a + between the two variables. For example, A+B



$X = A + B$

The NAND gate

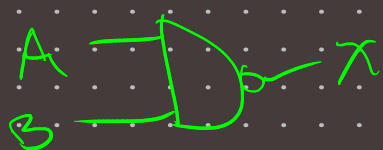
For a 2-input NAND gate, output X is LOW only when inputs A and B are HIGH; X is HIGH when either A or B is LOW, or when both A and B are LOW.



$X = A\bar{B} + \bar{A}B$

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

Logic Expressions for a NAND Gate:



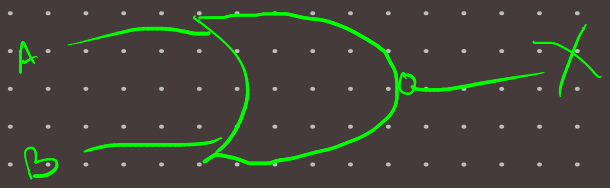
$= \overline{AB}$

The NOR Gate

For a 2-input NOR gate, output X is LOW when either input A or input B is HIGH, or when both A and B are HIGH; X is HIGH only when both A and B are LOW.

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

Logic Expressions for a NOR gate:



$X = \overline{A+B}$

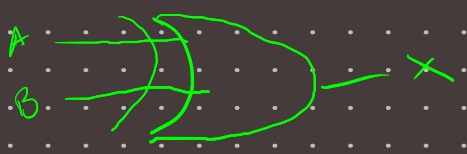
If $A = 0, B = 0$ $\quad X = \overline{0+0} = \overline{0} = 1$

$A = 0, B = 1$ $\quad X = \overline{0+1} = \overline{1} = 0$

$A = 1, B = 1$ $\quad X = \overline{1+1} = \overline{1} = 0$

Exclusive OR Gate

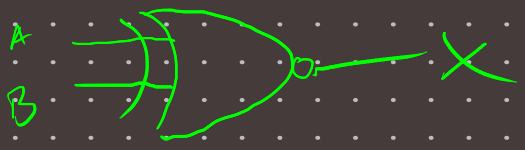
For an exclusive-OR gate, output X is HIGH when input A is LOW and input B is HIGH , or when input A is HIGH, and input B is LOW; X is LOW when A and B are both HIGH or both LOW



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

Exclusive NOR gate

For an exclusive NOR gate, output X is LOW when input A is LOW and input B is HIGH, or when A is HIGH and B is LOW; X is HGIH when A and B are both HIGH or both LOW.



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

$X = AB + \bar{A}\bar{B}$