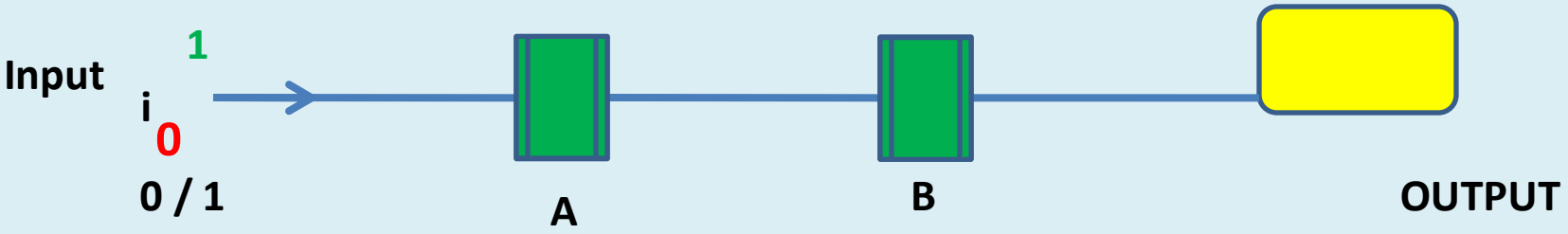
Introduction to Logic Gates

AND Gate

It is an electronic circuit, which generates an output signal of 1 if and only if all input signals are also 1

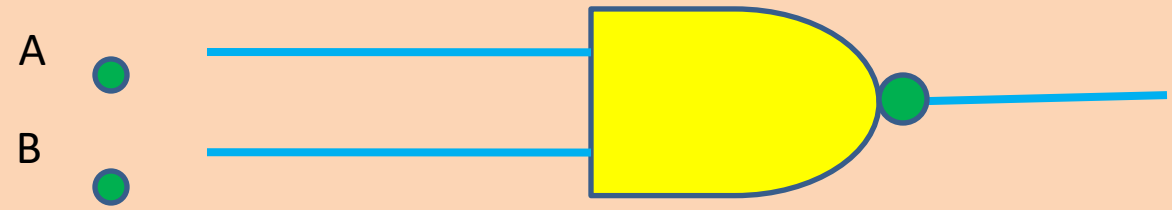
An AND gate is the physical realization of the logical multiplication (AND operation)



Suppose Input is 1

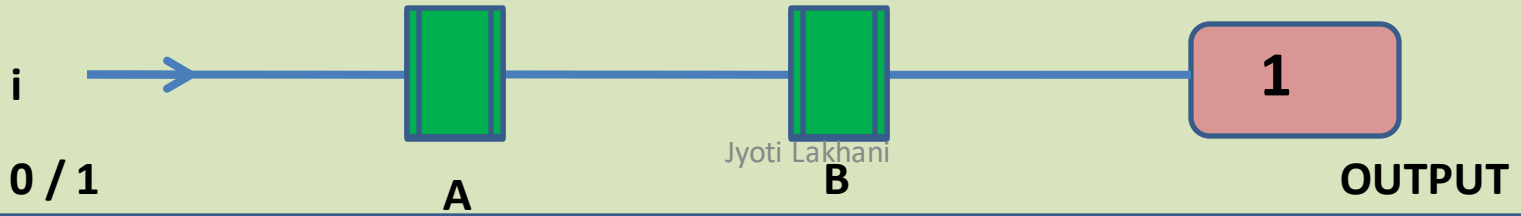
Suppose Input is 0

Block Diagram of AND Gate

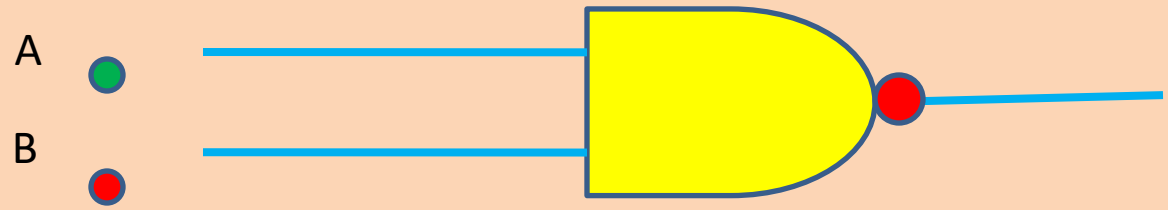


1 . 1 = 1

INPUT		OUTPUT
1	1	1
1	0	0
0	1	0
0	0	0

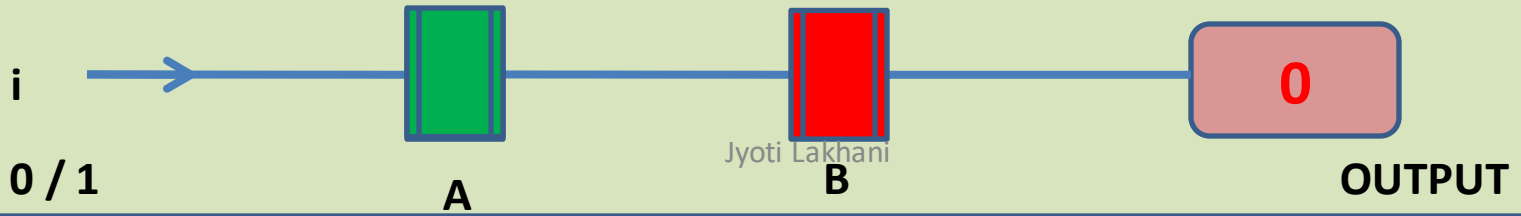


Block Diagram of AND Gate

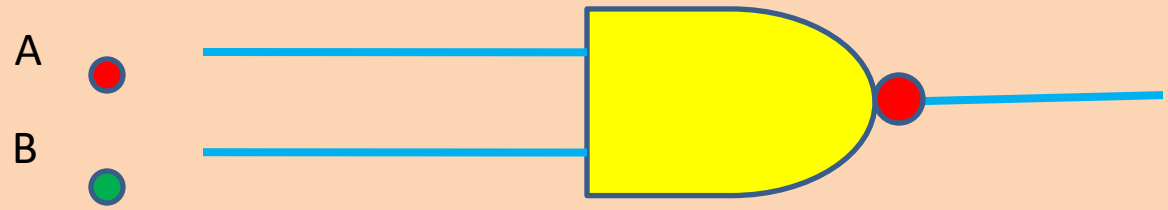


1 . 0 = 0

INPUT		OUTPUT
1	1	1
1	0	0
0	1	0
0	0	0

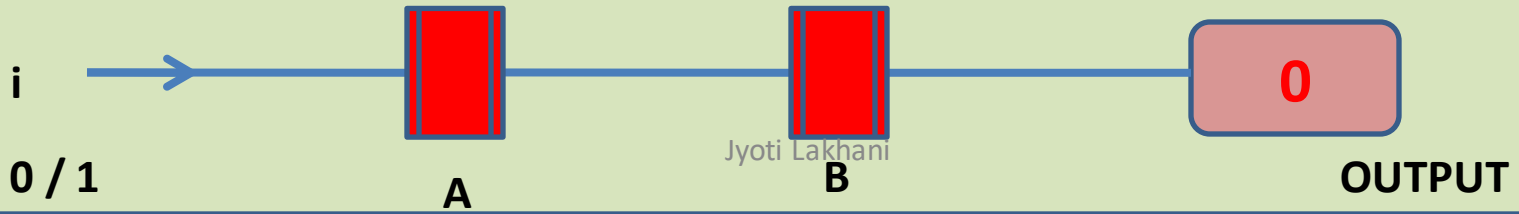


Block Diagram of AND Gate

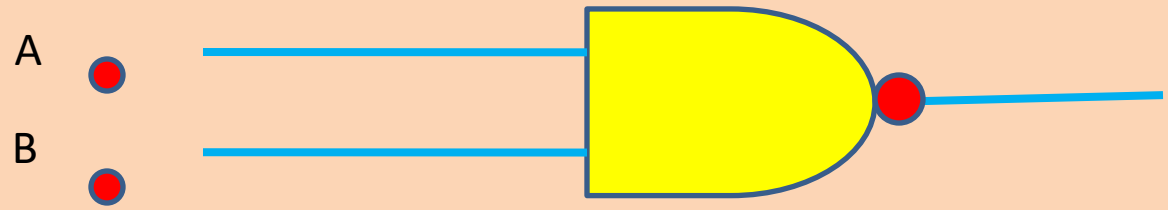


0 . 1 = 0

INPUT		OUTPUT
1	1	1
1	0	0
0	1	0
0	0	0

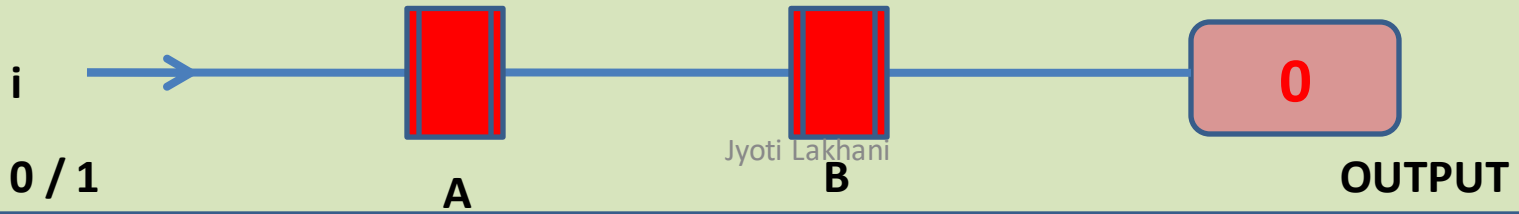


Block Diagram of AND Gate



0 . 0 = 0

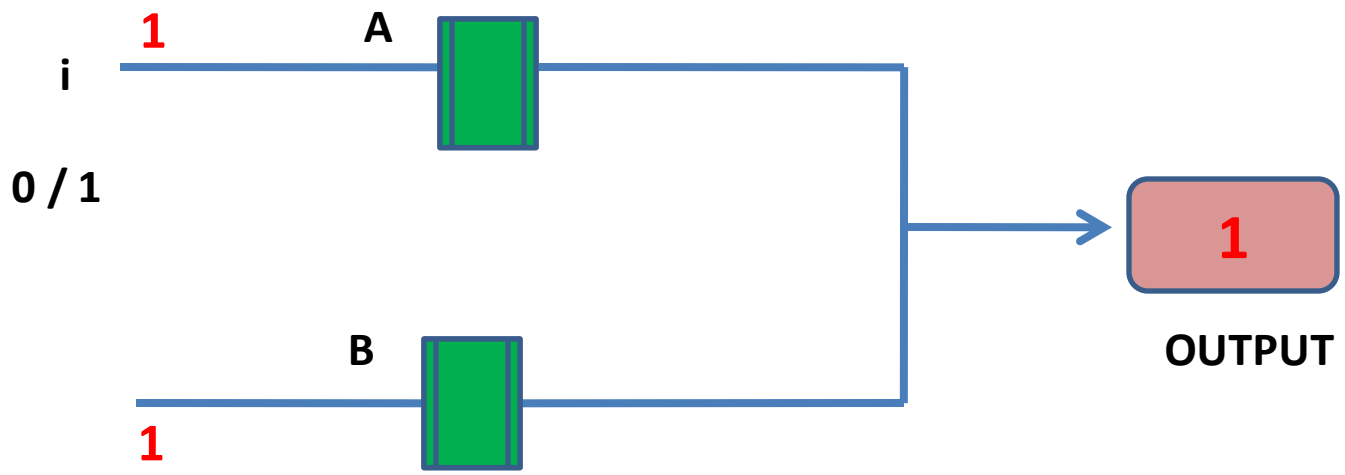
INPUT		OUTPUT
1	1	1
1	0	0
0	1	0
0	0	0



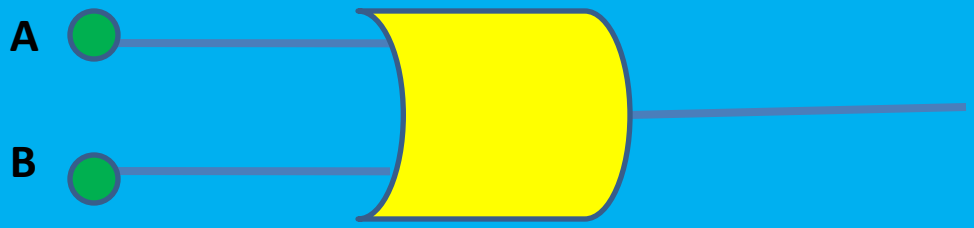
OR Gate

It is an electronic circuit,
which generates an output signal of 1, if any of the output signals is 1

It is the physical realization of logical OR

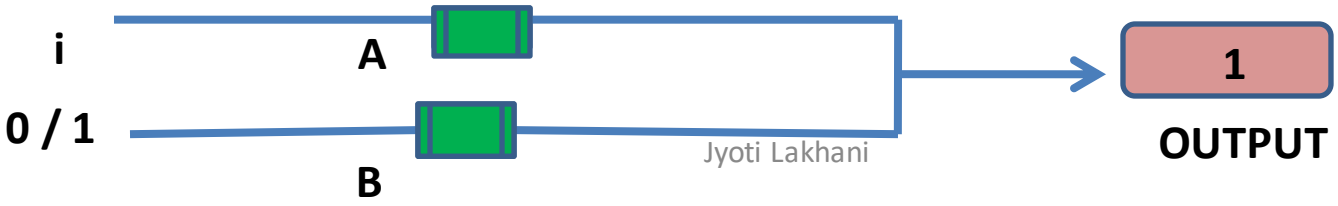


Block Diagram of OR Gate

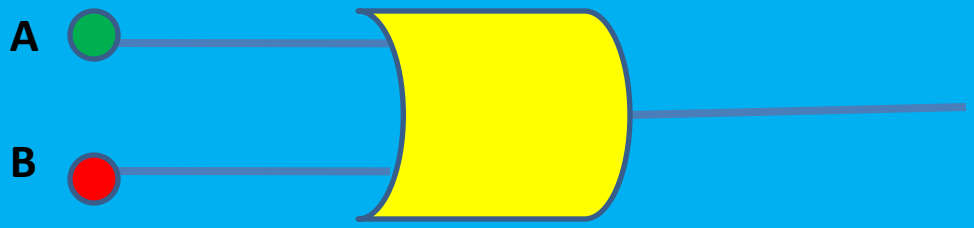


1 + 1 = 1

INPUT		OUTPUT
1	1	1
1	0	1
0	1	1
0	0	0

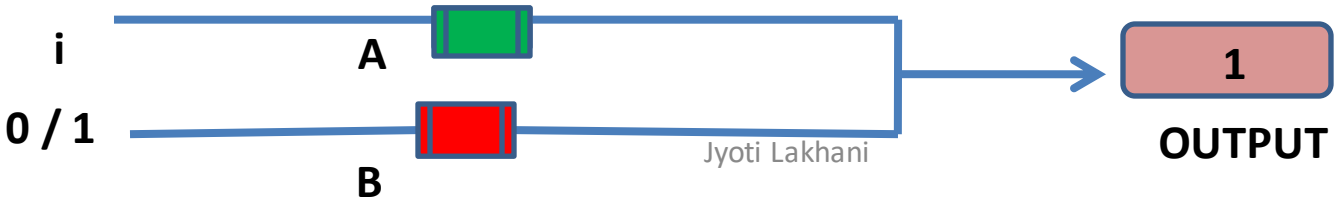


Block Diagram of OR Gate

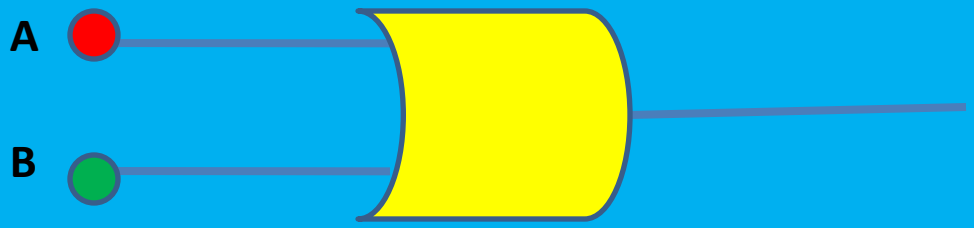


1 + 0 = 1

INPUT		OUTPUT
1	1	1
1	0	1
0	1	1
0	0	0

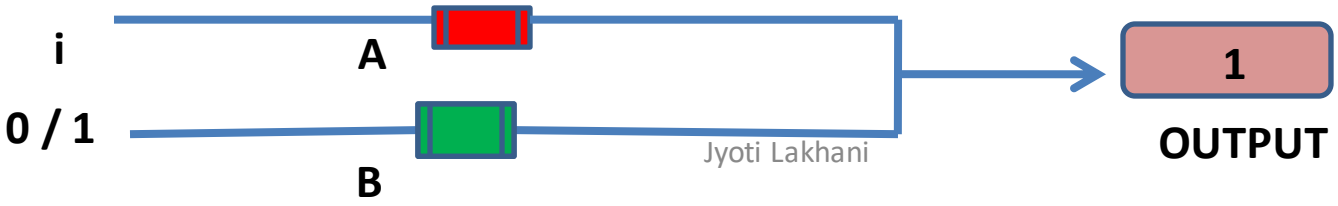


Block Diagram of OR Gate

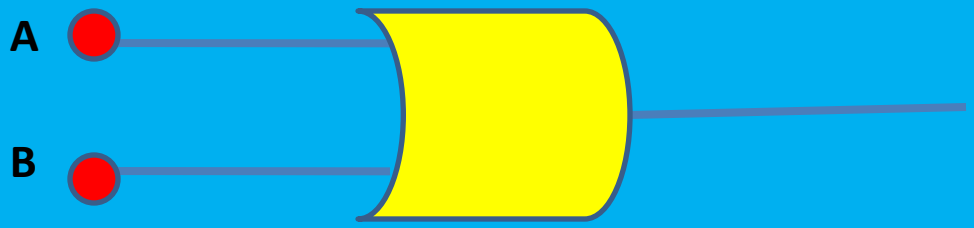


0 + 1 = 1

INPUT		OUTPUT
1	1	1
1	0	1
0	1	1
0	0	0



Block Diagram of OR Gate



0 + 0 = 0

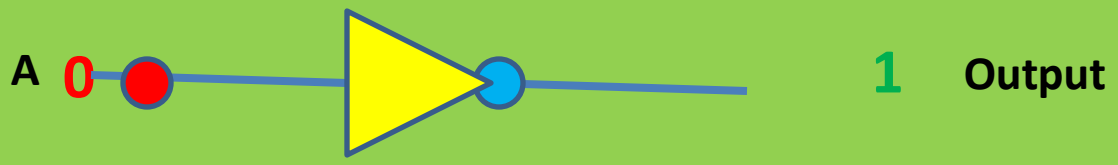
INPUT		OUTPUT
1	1	1
1	0	1
0	1	1
0	0	0

NOT Gate

It is an electronic circuit-
that generates an output signal, which is reverse of input signal

It is the physical realization of complementation operation

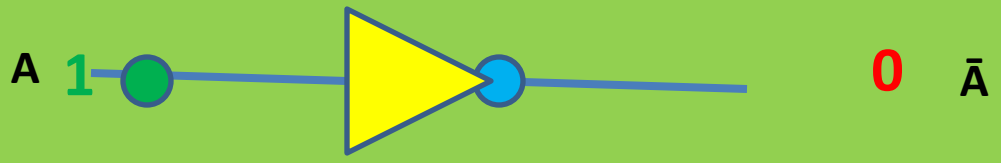
INPUT	OUTPUT
0	1
1	0



Not Gate is also called inverter because it inverts the input.

NOT Gate

INPUT	OUTPUT
0	1
1	0



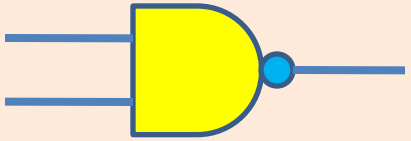
NAND Gate

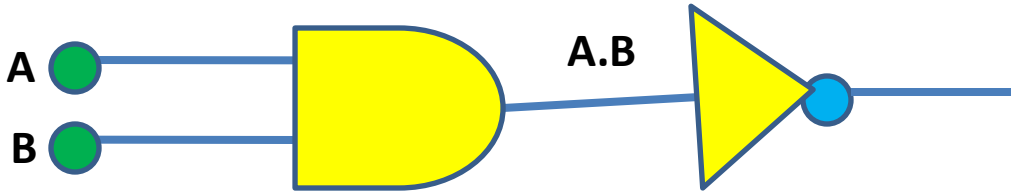
Not AND Gate - NOT + AND gate

It is a combination of NOT and AND gates

It is Complemented AND Gate

Symbol of NAND gate





Equation of NAND Gate

$$A \uparrow B = \overline{A.B} = \overline{A} + \overline{B}$$

Truth Table

INPUT		OUTPUT
1	1	0
1	0	1
0	1	1
0	0	1

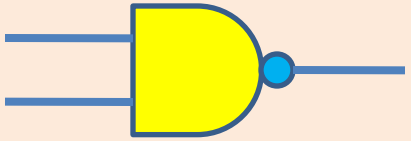
NAND Gate

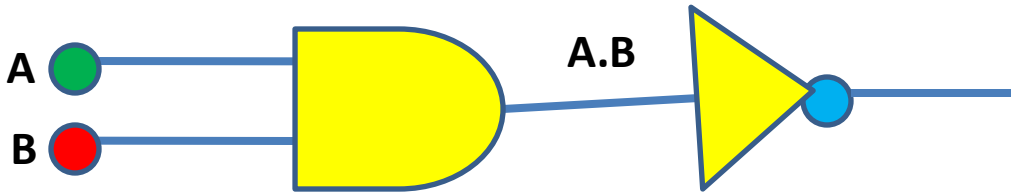
Not AND Gate - NOT + AND gate

It is a combination of NOT and AND gates

It is Complemented AND Gate

Symbol of NAND gate





Equation of NAND Gate

$$A \uparrow B = \overline{A.B} = \overline{A} + \overline{B}$$

Truth Table

INPUT		OUTPUT
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0	0	1

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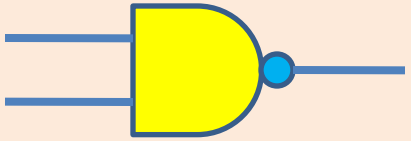

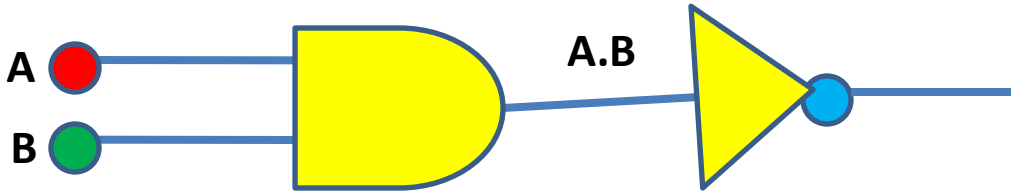

Equation of NAND Gate

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Truth Table

INPUT		OUTPUT
1	1	0
1	0	1
0	1	1
0	0	1

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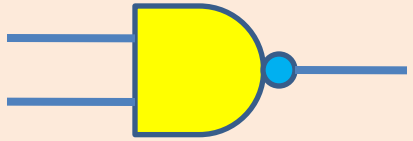
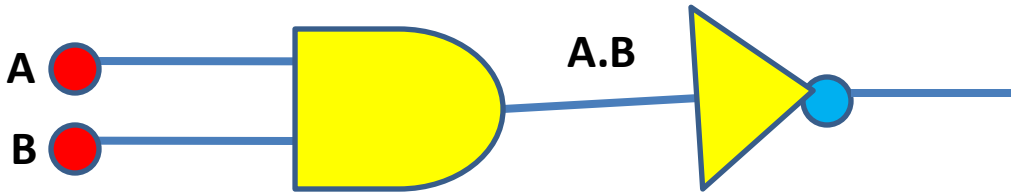




Equation of NAND Gate

$$A \uparrow B = \overline{A.B} = \overline{A} + \overline{B}$$

Truth Table

INPUT		OUTPUT
1	1	0
1	0	1
0	1	1
0	0	1

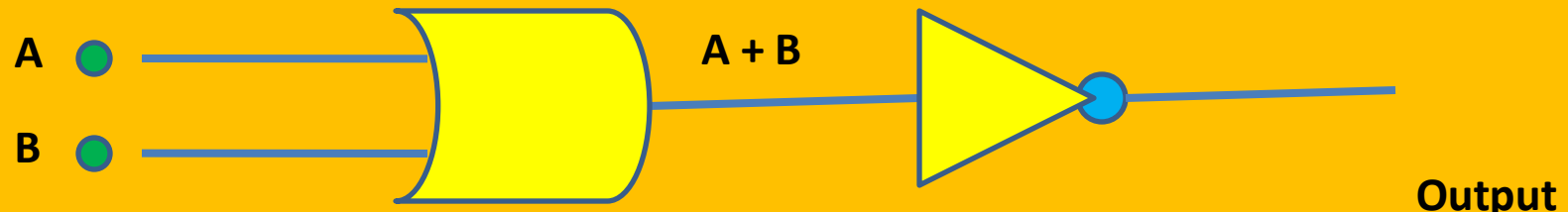
NOR Gate

NOT – OR Gate

NOT Gate + OR Gate

It is complement OR gate

Symbol of NOR Gate



1 + 1 = 0

Equation of NOR Gate

$$A \uparrow B = \overline{A + B} = \overline{A} \cdot \overline{B}$$

Truth Table

INPUT		OUTPUT
1	1	0
1	0	0
0	1	0
0	0	1

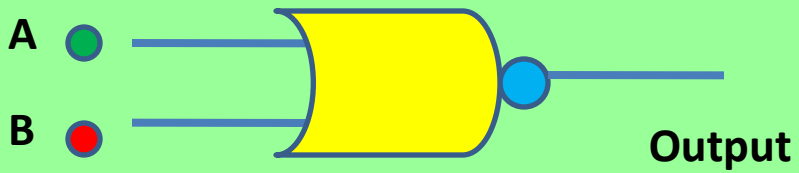
NOR Gate

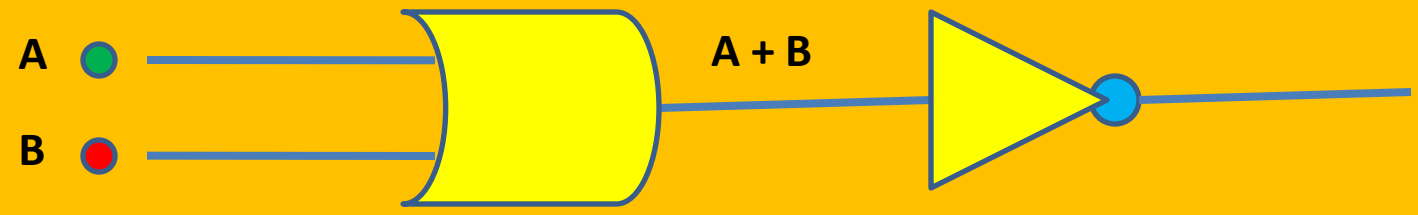
NOT – OR Gate

NOT Gate + OR Gate

It is complement OR gate

Symbol of NOR Gate





1 + 0 = 0

Equation of NOR Gate

$$A \uparrow B = \overline{A + B} = \overline{A} \cdot \overline{B}$$

Truth Table

INPUT		OUTPUT
1	1	0
1	0	0
0	1	0
0	0	1

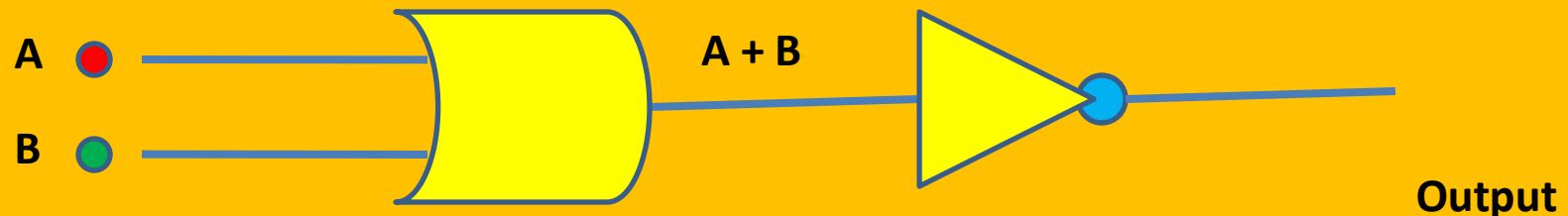
NOR Gate

NOT – OR Gate

NOT Gate + OR Gate

It is complement OR gate

Symbol of NOR Gate



0 + 1 = 0

Equation of NOR Gate

$$A \uparrow B = \overline{A + B} = \overline{A} \cdot \overline{B}$$

Truth Table

INPUT		OUTPUT
1	1	0
1	0	0
0	1	0
0	0	1

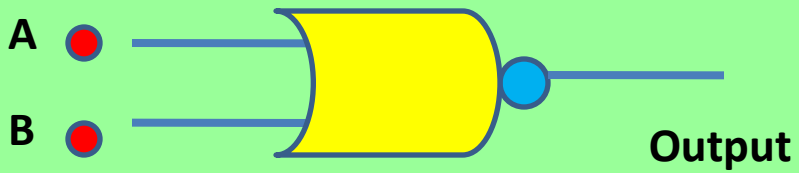
NOR Gate

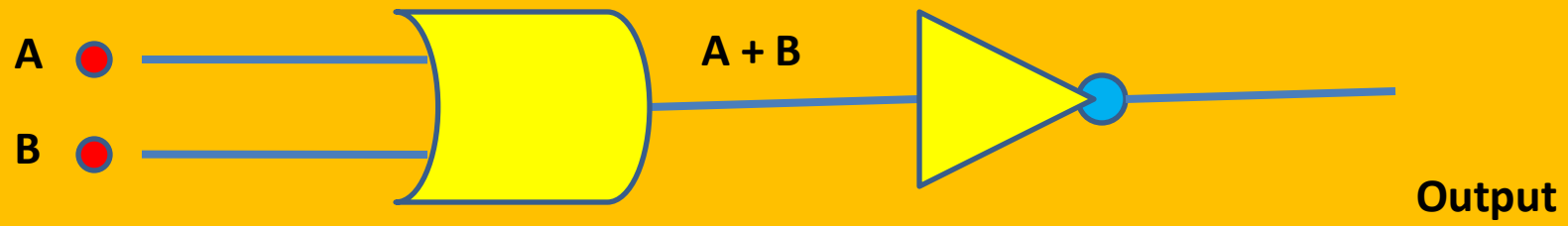
NOT – OR Gate

NOT Gate + OR Gate

It is complement OR gate

Symbol of NOR Gate





0 + 0 = 1

Equation of NOR Gate

$$A \uparrow B = \overline{A + B} = \overline{A} \cdot \overline{B}$$

Truth Table

INPUT		OUTPUT
1	1	0
1	0	0
0	1	0
0	0	1