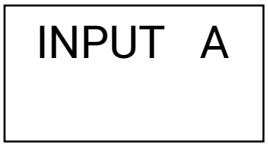
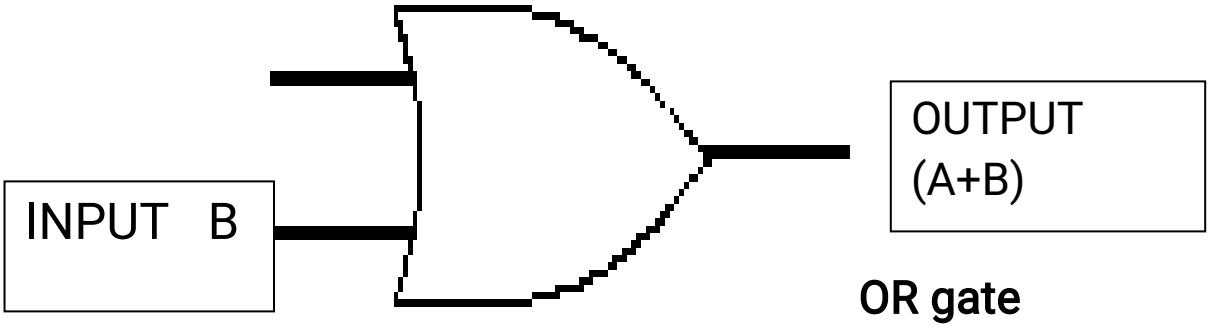
1. LOGIC GATES is an idealized or physical device implementing a Boolean function (Truth or False function). It performs logical operation on one or more inputs (binary) and produces just one output (binary). Logic gates usually represented with diagrams for the purpose of an easy illustration. The types of logic gates include:

- OR gates
- AND gates
- NOT gates
- NOR gates
- NAND gates

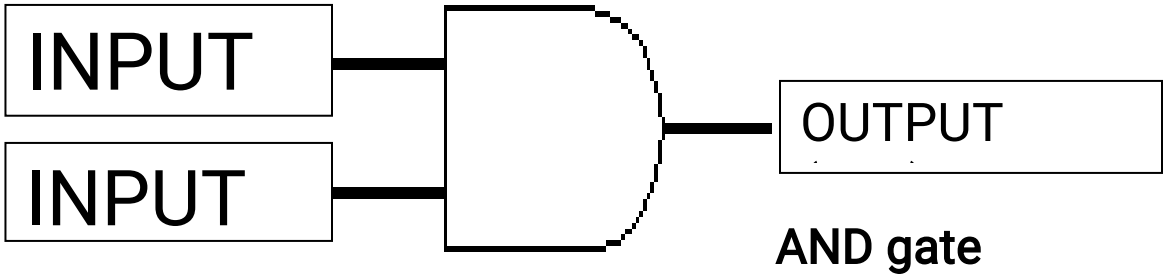
2. a. OR operation with the OR gates: In the OR operation with the OR gates, it makes use of two or more inputs (Truth or False inputs) to give just one output (Truth or False output). The *OR gate* gets its name from the fact that it behaves after the fashion of the logical inclusive "or." The output is "true" if either or both of the inputs are "true." If both inputs are "false," then the output is "false."





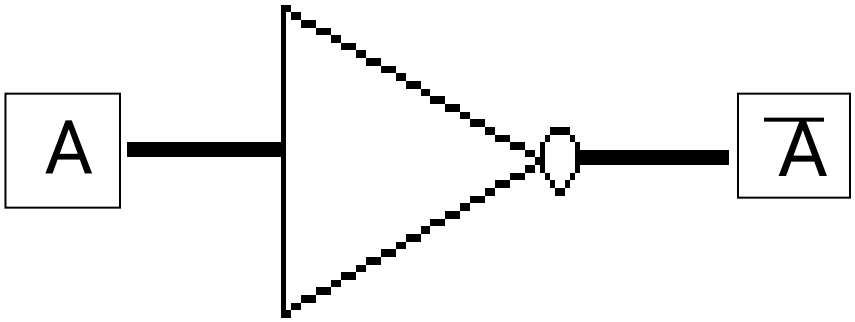
OR gate

b. AND operation with AND gates: The *AND gate* is so named because, if 0 is called "false" and 1 is called "true," the gate acts in the same way as the logical "and" operator. The illustration show the circuit symbol for an AND gate. (In the symbol, the input terminals are at left and the output terminal is at right.) The output is "true" when both inputs are "true." Otherwise, the output is "false."



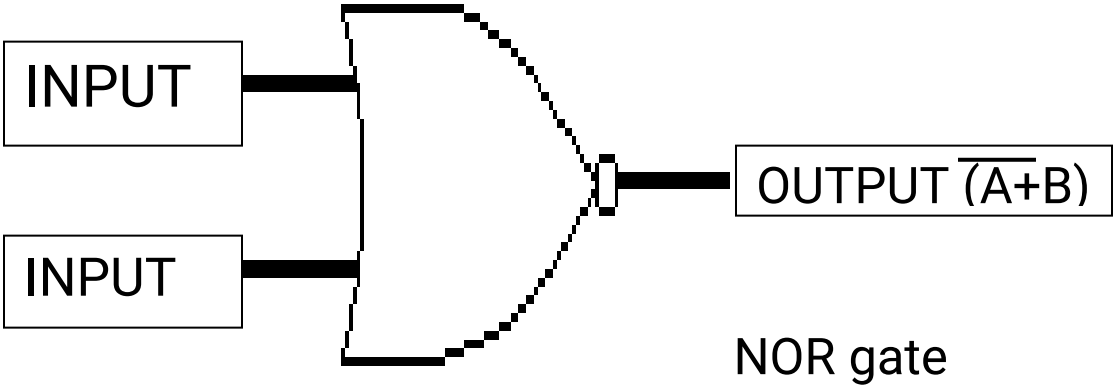
AND gate

c. NOT operation with NOT gates: A logical *inverter* sometimes called a *NOT gate* to differentiate it from other types of electronic inverter devices, has only one input. It reverses the logic state.



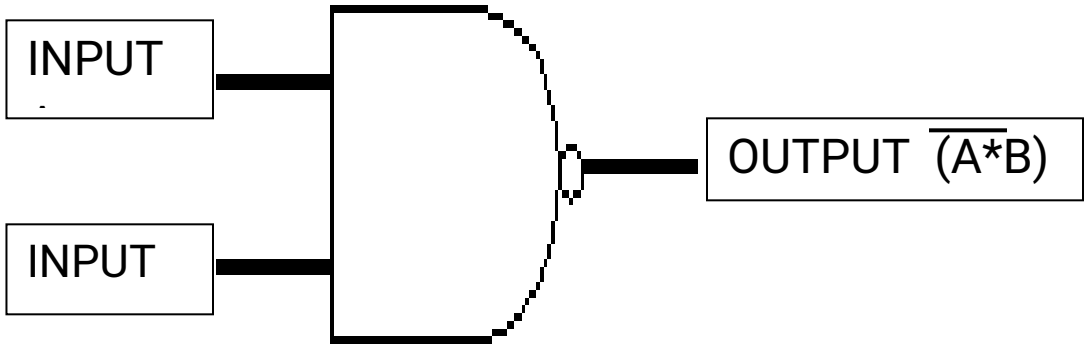
NOT gate

d. NOR operation with NOR gates: The *NOR gate* is a combination OR gate followed by an inverter. Its output is "true" if both inputs are "false." Otherwise, the output is "false."



NOR gate

e. NAND operations with NAND gates: The *NAND gate* operates as an AND gate followed by a NOT gate. It acts in the manner of the logical operation "and" followed by negation. The output is "false" if both inputs are "true." Otherwise, the output is "true."



NAND gate

3. a. AND operation: (*)

A	B	A*B
True	True	True
True	False	False
False	True	False
False	False	False

b. OR operation: (+)

A	B	A+B
True	True	True
True	False	True
False	True	True
False	False	False

c. NOT operation: (!)

A	!A
True	False
False	True

d. Combination of AND, OR, and NOT gates:

A	B	A+B	A*B	A+(A*B)	A*(A+B)	!(A+B)	(A+B)*(A*B)
True	True	True	True	True	True	False	True
True	False	True	False	True	True	False	False
False	True	True	False	False	False	False	False
False	False	False	False	False	False	True	False

4. Brown: Jones is guilty and Smith is innocent.

   Jones: If Brown is guilty then so is Smith.

   Smith: I am innocent but at least one of the others is guilty.

   B: “Brown is innocent”

   J: “Jones is innocent”

S: “Smith is innocent”

a. For Brown’s testimony: (!J*S)

   For Jones testimony: (!B->!S)

   For Smith’s testimony: S*(!J+!B)

B	J	S	!B	!J	!S	!J*S	!B->!S	!J+!B	S*(!J+!B)
True	True	True	False	False	False	False	False	False	False
True	True	False	False	False	True	False	False	False	False
True	False	True	False	True	False	True	False	True	True

True	False	False	False	True	True	False	False	True	False
False	True	True	True	False	False	False	False	True	True
False	True	False	True	False	True	False	True	True	False
False	False	True	True	True	False	True	False	True	True
False	False	False	True	True	True	False	True	True	False

b. i. Jones testimony is an implication of an event. “If Brown is guilty then so is Smith”(!B -> !S)

ii. None

iii. Not applicable

iv. Not applicable

5. a. My grandfather is smoking pipe: G

   He is reading a newspaper: N

   G -> N

   The deduction is right

   b. I want to eat ice cream at the movie: A

   I want to eat ice cream in front of the DVD: B

   A+B

   The deduction is wrong