

Logic Gates

Lesson Objectives



- To learn each type of logic gate
- To understand what truth tables are and how they relate to each type of logic gate.
- To combine different logic gates in a circuit based on a certain logical statement.

What is a Logic Gate?

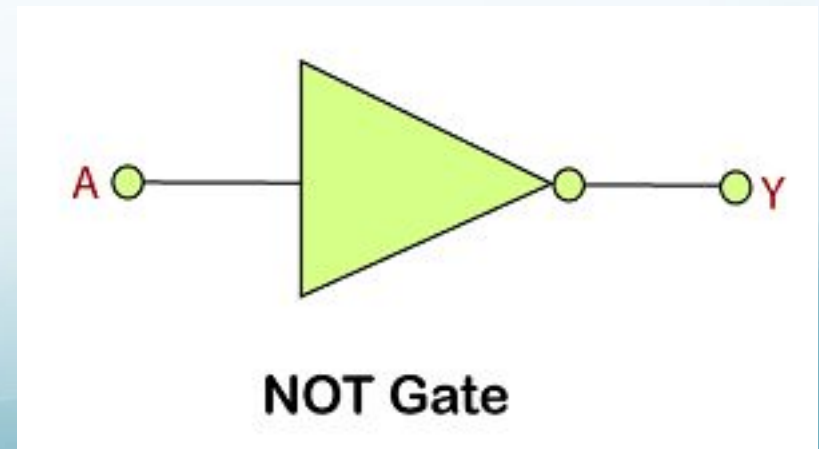


- A logic gate is a device that acts as a building block for all digital circuits.
- They perform basic logical functions that are fundamental to digital circuits.
- Many electronic devices that we use today use logic gates



NOT gate

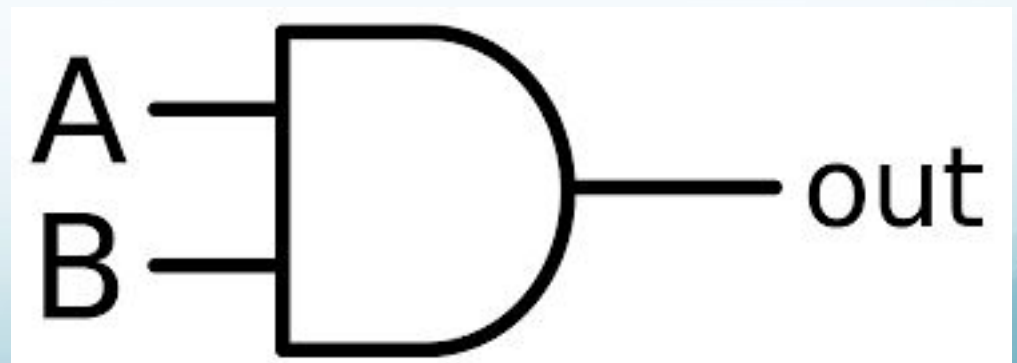
- NOT gate is the only gate that has one input and one output.
- It gives the inverted version of the input
- So if the input is true, the output will be false and vice versa.
- If A is 1, B is 0 (vice-versa)





AND gate

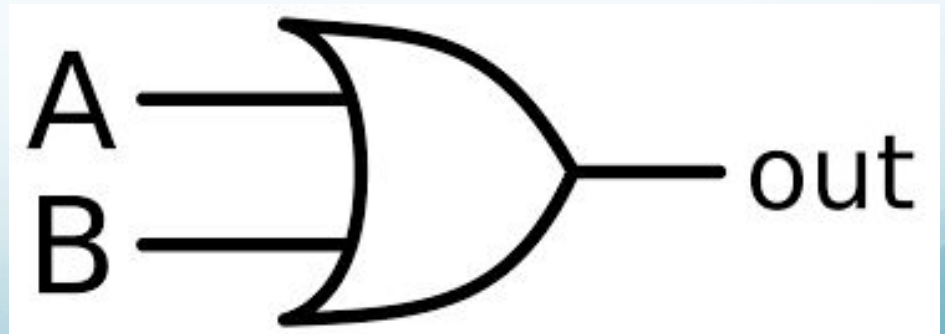
- The AND gate has two inputs – the only way in which the output can be true is if both the inputs are true.
- It implements logical conjunction
- So – IF A is 1 AND B is 1, Then C Is 1, else C is 0





OR gate

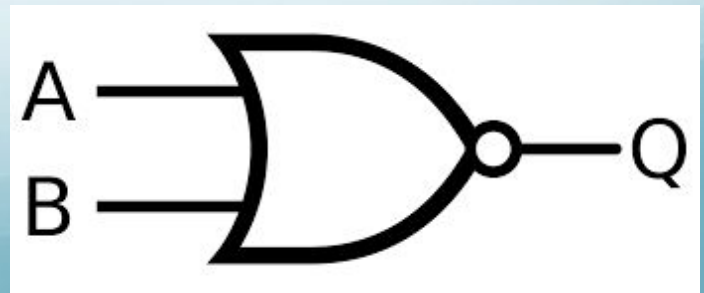
- This gate allows either one input to be true for the output to be true
- So, if A is 1 OR B is 1, C is 1, else C is 0.
- This means that the only way C can be 0 is if both inputs (A and B) are 0. Then it wouldn't satisfy the condition.



NOR



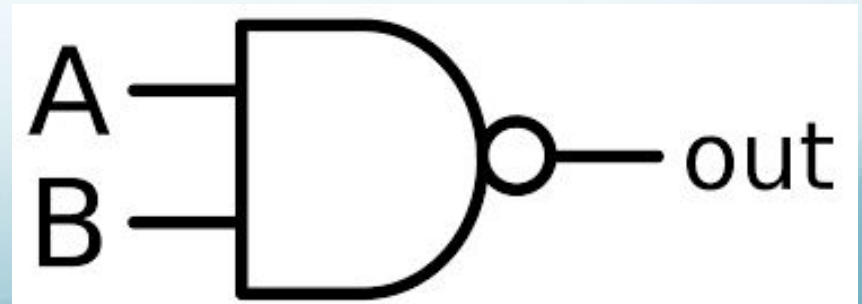
- There is a truth table and condition to memorize for this gate but it can also be deduced logically
- It can be read as NOT(OR)
- So, given the two inputs you calculate the output for the OR gate and you simply reverse the value as it has to obey the NOT instruction as well.
- So, the only way for the output to be true in a NOR gate is if both inputs are false or 0.





NAND gate

- Similar to NOR gate, NAND gate can be read in a different way
- It has two inputs and is a digital combination logic circuit that performs a logical inverse of an AND gate.
- Hence, if A is 1 NAND B is 1, C is 0, else C is 1.





XOR gate

- This gate stands for EXCLUSIVE OR gate
- It means that one and ONLY one value must be true for the output to be true
- So, in a truth table, if A is 1 and B is 0, the output C will be 1.
- Similarly, if A is 0 and B is 1, C will be 1.
- In all other cases, the output C will be 0.

