Number System

The Number system is a technique to represent and work with numbers. The most widely adopted number system is the Decimal number system which has 10 digits (0-9). Binary number system (0,1), Octal number system (0-7) and Hexadecimal number system (0-9, A, B, C, D, E, F, G) are other number systems. The number of digits in a system is called 'radix' or 'base'. The base of decimal, binary, octal hexadecimal system is 10, 2, 8 and 16 respectively.

A value of each digit in a number can be determined using

- The digit
- The position of the digit in the number
- The base of the number system (where base is defined as the total number of digits available in the number system).

1. **Decimal Number System**: The number system that we use in our day-to-day life is the decimal number system. Decimal number system has base 10 as it uses 10 digits from 0 to 9. In decimal number system, the successive positions to the left of the decimal point represent units, tens, hundreds, thousands and so on.

2. **Binary Number System:** Uses two digits, 0 and 1, also called base 2 number system . Each position in a binary number represents a 0 power of the base (2). Last position in a binary number represents a x power of the base (2).

3. **Octal Number System:** Uses eight digits, 0,1,2,3,4,5,6,7, also called base 8 number system, Each position in an octal number represents a 0 power of the base (8).

4. **Hexadecimal Number System:** Uses 10 digits and 6 letters, 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F. Letters represents numbers starting from 10. A = 10. B = 11, C = 12, D = 13, E = 14, F = 15. Also called base 16 number system .Each position in a hexadecimal number represents a 0 power of the base (16).

Comparison of Decimal , Binary, Octal and Hexadecimal system.

Decimal	Binary	Octal	Hexadecimal
0	0000	0	0
1	0001	1	1
2	0010	2	2
3	0011	3	3
4	0100	4	4
5	0101	5	5
6	0110	6	6
7	0111	7	7
8	1000	10	8

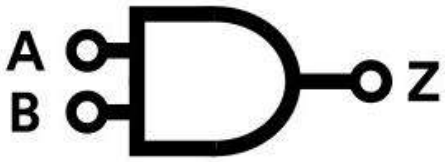
9	1001	11	9
10	1010	12	A
11	1011	13	B
12	1100	14	C
13	1101	15	D
14	1110	16	E
15	1111	17	F
16	10000	20	G

Logic Gates

These are the building blocks of any digital circuit that implement Boolean logic processes. It has only one output. Arrays of logic gates are used in digital integrated circuits (ICs). The basic logic gatesand their functioning (truth table) are mentioned in the following figure.

AND Gate

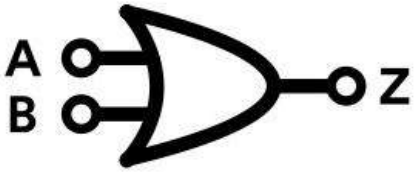
It is a digital logic gate with two or more inputs and one output which performs logical conjunction.



A	B	Z
0	0	0
0	1	0
1	0	0
1	1	1

OR Gate

It is a logic gate that produces inclusive disjunction. It is used in Boolean algebra and electronic circuits like transistor-transistor logic, and complementary metal-oxide semiconductors etc.

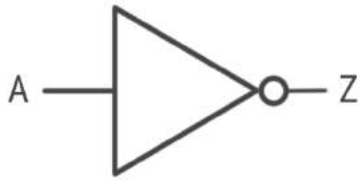


A	B	Z
0	0	0
0	1	1
1	0	1

1	1	1

NOT Gate

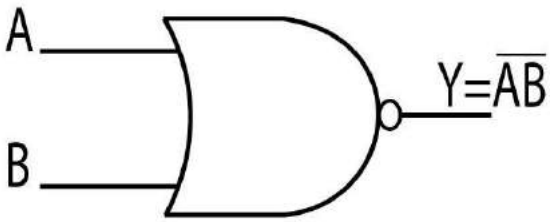
NOT gate is a single input gate. It performs the inversion of given input. So, it is called Inverter.



A	Z
0	1
1	0

NAND Gate

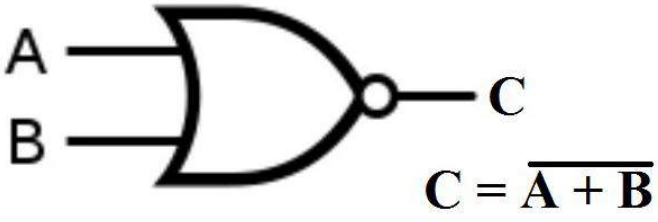
It is the combination of AND & NOT gates. It is the opposite of AND logic gate.



A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

NOR Gate

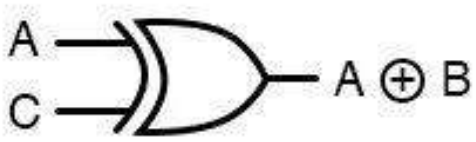
It is the combination of NOT & OR gates. 'neither this nor that' is the principle of NOR gate.



A	B	C
0	0	0
0	1	0
1	0	0
1	1	1

XOR Gate

XOR gate is a special type of gate. It is used in the half adder, full adder and subtractor and controlled inverter circuit. It is also used in the computers for implementing the binary addition.



A	B	A⊕B
0	0	0
0	1	1
1	0	1
1	1	0