

Number System

(Digital Electronic)

Technical Education & Social Welfare Society

The Best Computer Education Institute

Number System

Number system used to represent the computer data & Information.

Four Types of Number System.

Number System	Used Digits	Base (Radix)	Number
Binary Number	0 - 1	2	$(11001010)_2$
Decimal Number	0 - 9	10	$(58470)_{10}$
Octal Number	0 - 7	8	$(46201)_8$
Hexadecimal Number	0 - F (15)	16	$(8FA01)_{16}$

Valid Number

$(100110)_2$

$(1001011)_8$

$(8745)_{10}$

$(B320)_{16}$

Invalid number

$(100400)_2$

$(87010)_8$

$(45AH0)_{16}$

$(450E0)_{10}$

Number System Conversion

Q.1

Binary to Decimal ?

$$(100101)_2 = ?$$

1	0	0	1	0	1
32	16	8	4	2	1

$$32 + 4 + 1 = 37$$

Ans. $(37)_{10}$

Number	Table	Growth
1	2	1
2	4	2
3	6	4
4	8	8
5	10	16
6	12	32
7	14	64
8	16	128
9	18	256

Q.2

Decimal to Binary ?

$$(25)_{10} = ?$$

1 1 0 0 1

16 8 4 2 1

Ans. $(11001)_2$

$$(54)_{10} = ?$$

1 1 0 1 1 0

32 16 8 4 2 1

Ans. $(110110)_2$

Growth
1
2
4
8
16
32
64
128
256
512
1024
2048

Q.3

Binary to Octal ?

$$(10110011)_2 = ?$$

010 110 011

2 6 3

Ans. (263)₈

$$(110010100101)_2 = ?$$

110 010 100 101

6 2 4 5

Ans. (6245)₈

Decimal	Binary
0	0
1	1
2	10
3	11
4	100
5	101
6	110
7	111

Q.4

Octal to Binary ?

$$(326)_8 = ?$$

011 010 110

Ans. $(11010110)_2$

$$(2531)_8 = ?$$

010 101 011 001

Ans. $(10101011001)_2$

Decimal	Binary
0	0
1	1
2	10
3	11
4	100
5	101
6	110
7	111

Q.5

Binary to Hexadecimal ?

$$(10111010110)_2 = ?$$

0101 1101 0110

5 13 6

Ans. (5D6)₁₆

$$(11101100101010)_2 = ?$$

0011 1011 0010 1010

3 11 2 10

Ans. (3B2A)₁₆

Decimal	Binary
0	0
1	1
2	10
3	11
4	100
5	101
6	110
7	111
8	1000
9	1001
A—10	1010
B—11	1011
C—12	1100
D—13	1101
E—14	1110
F—15	1111

Q.6

Hexadecimal to Binary ?

$$(3F6)_{16} = ?$$

0011 1111 0110

Ans. $(1111110110)_2$

$$(A120)_{16} = ?$$

1010 0001 0010 0000

Ans. $(1010000100100000)_2$

Decimal	Binary
0	0
1	1
2	10
3	11
4	100
5	101
6	110
7	111
8	1000
9	1001
A—10	1010
B—11	1011
C—12	1100
D—13	1101
E—14	1110
F—15	1111

Q.7

Decimal to Octal ?

Decimal → Binary → Octal

$$(43)_{10} = ?$$

1 0 1 0 1 1

32 16 8 4 2 1

101 011

5 3

Ans. (53)₈

$$(210)_{10} = ?$$

1 1 0 1 0 0 1 0
128 64 32 16 8 4 2 1

011 010 010

3 2 2

Ans. (322)₈

Q.8

Octal to Decimal ?

Octal  **Binary**  **Decimal**

$$(63)_8 = ?$$

110 011

1 1 0 0 1 1

32 16 8 4 2 1

$$32 + 16 + 2 + 1 = 51$$

Ans. $(51)_{10}$

Q.9

Decimal to Hexadecimal ?

Decimal → Binary → Hexadecimal

$$(43)_{10} = ?$$

1 0 1 0 1 1

32 16 8 4 2 1

0010 1011

2 11

Ans. (2B)₁₆

$$(210)_{10} = ?$$

1 1 0 1 0 0 1 0
128 64 32 16 8 4 2 1

1101 0010

13 2

Ans. (D2)₁₆

Q.10

Hexadecimal to Decimal ?

Hexadecimal  **Binary**  **Decimal**

$$(6A3)_{16} = ?$$

0110 1010 0011

0	1	1	0	1	0	1	0	0	0	1	1
2048	1024	512	256	128	64	32	16	8	4	2	1

$$1024 + 512 + 128 + 32 + 2 + 1 = 1699 \quad \text{Ans. } (1699)_{10}$$

Q.11

Octal to Hexadecimal ?

Octal  **Binary**  **Hexadecimal**

$$(63)_8 = ?$$

110 011

110011

0011 0011

3 3

Ans. (33)₁₆

$$(542)_8 = ?$$

101 100 010

101100010

0001 0110 0010

1 6 2

Ans. (162)₁₆

Q.12

Hexadecimal to Octal ?

Hexadecimal → Binary → Octal

$(A50)_{16} = ?$

1010 0101 0000

101001010000

101 001 010 000

5 1 2 0

Ans. $(5120)_8$

Binary Arithmetic

- **Binary Addition**
- **Binary Multiplication**
- **Binary Subtraction**
- **Binary Division**

Binary Addition

$$\begin{array}{r} \\ \\ + \\ \hline 1 \end{array}$$

$$\begin{array}{r} \\ \\ + \\ \hline 1 \end{array}$$

A	B	C	Sum		
0	+	0	0		
0	+	1	1		
1	+	0	1		
1	+	1	10		
1	+	1	+	1	11

$$\begin{array}{r} \\ \\ + \\ \hline 1 \end{array}$$

Binary Multiplication

$$\begin{array}{r} 101101 \\ \times 110 \\ \hline 000000 \\ 101101 \\ 101101 \\ \hline 100001110 \end{array}$$

The diagram illustrates the binary multiplication of 101101 and 110. The first row shows the multiplicand 101101 and the multiplier 110, separated by a horizontal line. The second row shows the first partial product, 000000, in red. The third row shows the second partial product, 101101, in red, with a blue arrow pointing down to the final result. The fourth row shows the third partial product, 101101, in red, with a blue arrow pointing down to the final result. The final result, 100001110, is shown in green and enclosed in a red box.