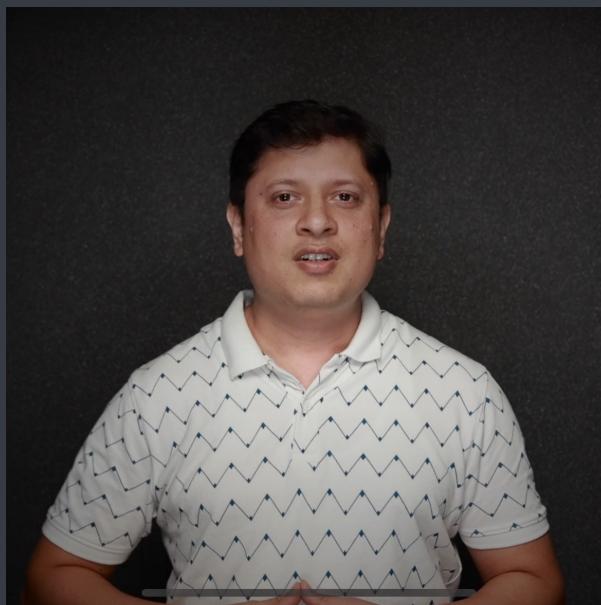


C Language

# Fundamentals of Computers



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## Agenda

- ① What is a computer?
- ② Number System
- ③ Concept of 0s and 1s

# Computer

- Computer is an electronic device which takes some input, processes it and gives output



# Binary Number System

Decimal NS      0 1 2 3 4 5 6 7 8 9

Octal NS      0 1 2 3 4 5 6 7

Hexadecimal NS      0 1 2 3 4 5 6 7 8 9 A B C D E F

Binary NS      0 1

| DNS | ONS | HNS | BNS   | DNS | ONS | HNS | BNS     |
|-----|-----|-----|-------|-----|-----|-----|---------|
| 0   | 0   | 0   | 0     | 19  | 23  | 13  | 10011   |
| 1   | 1   | 1   | 1     | 20  | 24  | 14  | 10100   |
| 2   | 2   | 2   | 10    | 21  | 25  | 15  | 10101   |
| 3   | 3   | 3   | 11    | 22  | 26  | 16  | 10110   |
| 4   | 4   | 4   | 100   | 23  | 27  | 17  | 10111   |
| 5   | 5   | 5   | 101   | 24  | 30  | 18  | 11000   |
| 6   | 6   | 6   | 110   | 25  | 31  | 19  | 11001   |
| 7   | 7   | 7   | 111   | 26  | 32  | 1A  | 11010   |
| 8   | 10  | 8   | 1000  | 27  | 33  | 1B  | 11011   |
| 9   | 11  | 9   | 1001  | 28  | 34  | 1C  | 11100   |
| 10  | 12  | A   | 1010  | 29  | 35  | 1D  | 11101   |
| 11  | 13  | B   | 1011  | 30  | 36  | 1E  | 11110   |
| 12  | 14  | C   | 1100  | 31  | 37  | 1F  | 11111   |
| 13  | 15  | D   | 1101  | 32  | 40  | 20  | 1000000 |
| 14  | 16  | E   | 1110  | 33  | 41  | 21  | 1000001 |
| 15  | 17  | F   | 1111  | 34  | 42  | 22  | 1000100 |
| 16  | 20  | 10  | 10000 | 35  | 43  | 23  | 1000111 |
| 17  | 21  | 11  | 10001 |     |     |     |         |
| 18  | 22  | 12  | 10010 |     |     |     |         |

thousands Hundreds tens unit place

2 4 5 7

$10^3$   $10^2$   $10^1$   $10^0$

$$2 \times 10^3 + 4 \times 10^2 + 5 \times 10^1 + 7 \times 10^0 \\ = 2457$$

Decimal  
0 to 9

(352)<sub>8</sub>

$8^2$   $8^1$   $8^0$

$$3 \times 8^2 + 5 \times 8^1 + 2 \times 8^0 \\ 192 + 40 + 2 = (234)_{10}$$

Octal  
0 to 7

$(25)_{16}$

$16^1 \quad 16^0$

$$2 \times 16^1 + 5 \times 16^0$$

$$32 + 5$$

$(37)_{10}$

$11001$

$2^4 \ 2^3 \ 2^2 \ 2^1 \ 2^0$

$$1 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 \\ + 0 \times 2^1 + 1 \times 2^0$$

$$2^4 + 2^3 + 2^0 \\ 16 + 8 + 1$$

$(25)_{10}$

# Place Value

DNS

$$\dots \ 10^3 \ 10^2 \ 10^1 \ 10^0$$

ONS

$$\dots \ 8^3 \ 8^2 \ 8^1 \ 8^0$$

HNS

$$\dots \ 16^3 \ 16^2 \ 16^1 \ 16^0$$

BNS

$$\dots \ 2^3 \ 2^2 \ 2^1 \ 2^0$$

# Convert Decimal to Binary

$2^8 \ 2^7 \ 2^6 \ 2^5 \ 2^4 \ 2^3 \ 2^2 \ 2^1 \ 2^0$   
256 128 64 32 16 8 4 2 1

25

1 1001

2 | 25  
2 | 12    1

76

1 001100

2 | 5    0↑  
2 | 3    0  
2 | 1    1  
0    1

204

11001100

11001

# Convert Binary to Decimal

$$\begin{array}{r} 5 \leftarrow 3 \quad 2 \quad 1 \quad 0 \\ \downarrow \quad | \quad | \quad 0 \quad 0 \quad 0 \\ 32 + 16 + 8 = 56 \end{array}$$

$$\begin{array}{r} 6543210 \\ 1010101 \\ \hline 10 \end{array} = 64 + 16 + 4 + 1 = 85$$

$$1 + 1 = 2$$

$$(34)_8 \rightarrow (11100)_2$$

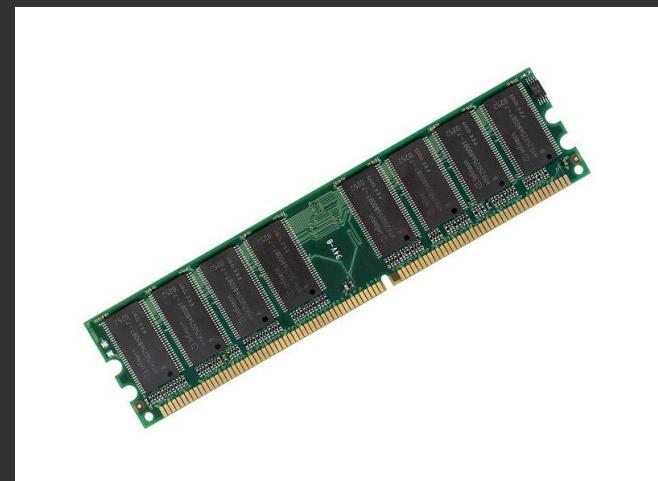
|   |     |
|---|-----|
| 0 | 000 |
| 1 | 001 |
| 2 | 010 |
| 3 | 011 |
| 4 | 100 |
| 5 | 101 |
| 6 | 110 |
| 7 | 111 |

$$(15246)_8 \\ (1101010100110)_2$$

# Concept of 0's and 1's

There is no physical significance of 0's and 1's in computer

They are just representation of two states in the hardware



## Binary Language

Computer can understand only binary signals, which can be stored, transmitted and processed