NUMBER SYSTEMS

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NUMBER SYSTEMS

- Decimal (Base 10)
- Binary (Base 2)
- Octal (Base 8)
- Hexadecimal (Base 16)

IMPORTANCE OF NUMBER SYSTEMS

- • Used in computers
- • Binary simplifies hardware
- • Hexadecimal shortens binary

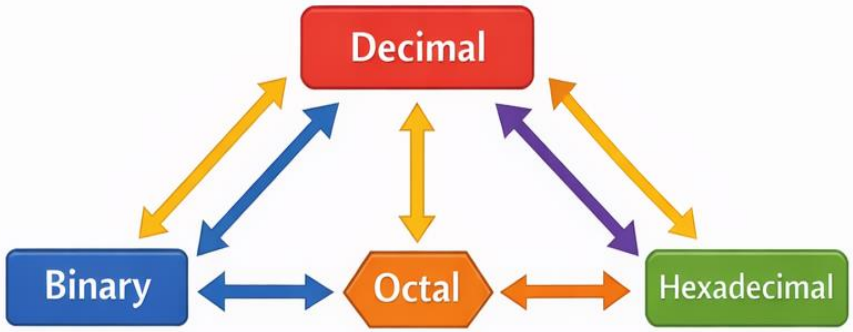
CONVERSIONS BETWEEN NUMBER SYSTEMS

- Decimal ↔ Binary
- Decimal ↔ Octal
- Decimal ↔ Hexadecimal
- Binary ↔ Octal
- Binary ↔ Hexadecimal
- Octal ↔ Hexadecimal

Conversions Between Number Systems

Converting between different number systems

- Decimal ↔ Binary
  - *Example:* $10 \rightarrow 1010_2$
- Decimal ↔ Octal
  - *Example:* $10 \rightarrow 12_8$
- Decimal ↔ Hexadecimal
  - *Example:* $10 \rightarrow A_{16}$
- Binary ↔ Octal
  - *Example:* $1010_2 \rightarrow 12_8$
- Binary ↔ Hexadecimal
  - *Example:* $1010_2 \rightarrow A_{16}$
- Octal ↔ Hexadecimal
  - *Example:* $12_8 \rightarrow A_{16}$



DECIMAL TO BINARY (STEP BY STEP)

- Example: 10_{10}
- $10 \div 2 = 5$ r0
- $5 \div 2 = 2$ r1
- $2 \div 2 = 1$ r0
- $1 \div 2 = 0$ r1
- Result: 1010_2

BINARY TO DECIMAL (STEP BY STEP)

- Example: 1010_2
- $1\times2^3 + 0\times2^2 + 1\times2^1 + 0\times2^0$
- Result: 10_{10}

DECIMAL TO OCTAL (STEP BY STEP)

- Example: 10_{10}
- $10 \div 8 = 1$ r2
- $1 \div 8 = 0$ r1
- Result: 12_8

DECIMAL TO HEXADECIMAL (STEP BY STEP)

- Example: 10_{10}
- $10 \div 16 = 0$ r10 $\rightarrow$ A
- Result: A_{16}

BINARY TO OCTAL

- 1010 → 001 010
- 001=1
- 010=2
- Result: 12_8

BINARY TO HEXADECIMAL

- $1010 \rightarrow A$
- Result: A_{16}

OPERATIONS IN NUMBER SYSTEMS

- Addition
- Subtraction
- Multiplication

BINARY ADDITION

- 1011 + 0101 = 10000

BINARY MULTIPLICATION

- $101 \times 10 = 1010$

EXAM QUESTION 1

- Convert 15_{10} to Binary
- Answer: 1111_2

EXAM QUESTION 2

- Convert 1101_2 to Decimal
- Answer: 13_{10}

EXAM QUESTION 3

- $10101_2 + 00111_2$
- Answer: 11100_2