

$$\begin{aligned}
 \text{Carry} &= AB\bar{C} + \bar{A}BC + \boxed{A\bar{B}C + A\bar{B}C} \\
 &= AB\bar{C} + \bar{A}BC + AC(\bar{B} + B) \\
 &= AB\bar{C} + \bar{A}B\bar{C} + AC \\
 &= AB\bar{C} + C(\bar{A}B + A) \\
 &= AB\bar{C} + C(A + \bar{B}) \quad [\because \bar{A}B + A = 1 + B] \\
 &= \underline{AB\bar{C}} + \underline{AC} + BC \\
 &= A(\underline{B\bar{C}} + \underline{C}) + BC \\
 &= A(B + C) + BC \quad [\because \bar{C}B + C = C + B] \\
 &= \boxed{AB + AC + BC}
 \end{aligned}$$

$$\begin{aligned}
 0 + 1 &= 1 \\
 1 + 0 &= 1
 \end{aligned}$$

$$\begin{aligned}
 &\bar{A}B + A \\
 &= \bar{A}B + A \cdot 1 \\
 &= \bar{A}B + A(1 + B) \\
 &= \bar{A}B + A + A\bar{B} \\
 &= A + B(A + \bar{A}) \\
 &= A + B
 \end{aligned}$$

3 + 2 = 5 <sup>2nd gate</sup>

$\begin{array}{r} 2 \text{ NOT} \\ 4 \text{ AND} \\ 2 \text{ OR} \end{array}$

$$A\bar{B} + \bar{A}B$$

$$\begin{aligned}
 A\bar{B} + \bar{A} &= \bar{A} + B \\
 \Rightarrow A\bar{B} + \bar{A}(1 + B) & \\
 \Rightarrow A\bar{B} + \bar{A} + \bar{A}B & \\
 \Rightarrow A\bar{B} + \bar{A}B + \bar{A} & \\
 \Rightarrow B(A + \bar{A}) + \bar{A} & \\
 \Rightarrow B \cdot 1 + \bar{A} & \\
 \Rightarrow B + \bar{A} & \Rightarrow \bar{A} + B
 \end{aligned}$$

— o —

## # Base Conversion

binary

decimal

decimal

hexadecimal

→ 1257

$$\begin{array}{r}
 5 \times 2 \times 10^2 \rightarrow 10 \times 10^2 \rightarrow 10^3 \\
 \uparrow \\
 5 \times 2^0
 \end{array}$$

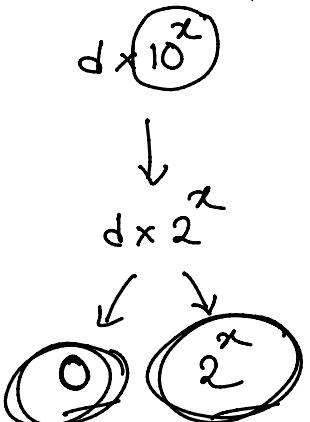
$$\begin{aligned}
 (1257)_{10} &\rightarrow (1 \times \underline{10^3}) + (2 \times \underline{10^2}) + (5 \times \underline{10^1}) + (7 \times \underline{10^0}) \rightarrow \underline{1000} + \underline{200} + \underline{50} + \underline{7}
 \end{aligned}$$

$$(1257)_{10} \rightarrow (1 \times 10^3) + (2 \times 10^2) + (5 \times 10^1) + (7 \times 10^0) \rightarrow \underbrace{1000}_1 + \underbrace{200}_2 + \underbrace{50}_5 + \underbrace{7}_7$$

$$(21)_{10} \rightarrow 2 \times 10^1 + 1 \times 10^0 \rightarrow \underbrace{20}_2 + \underbrace{1}_1$$

$$\rightarrow \underbrace{16}_1 + \underbrace{4}_1 + \underbrace{1}_1 \rightarrow \underbrace{2^4}_2 + \underbrace{2^2}_2 + \underbrace{2^0}_1$$

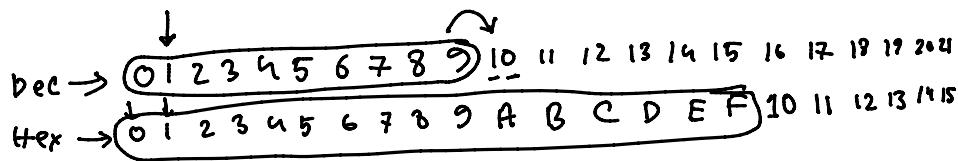
$$\begin{array}{cccccc} 1 & 0 & 1 & 0 & 1 & \\ \leftarrow & 1 \times 2^4 & 0 \times 2^3 & 1 \times 2^2 & 0 \times 2^1 & 1 \times 2^0 \\ \end{array}$$



[0..9] [A, B, C, D, E, F]  
 $_{10} \quad _{11} \quad _{12} \quad _{13} \quad _{14} \quad _{15}$

$$(21)_{10} \rightarrow (15)_{16}$$

$$\rightarrow (1 \times 16^1) + (5 \times 16^0)$$



$$(1257)_{10} \rightarrow \begin{array}{c} 1024 + 128 + 64 + 32 + 8 + 1 \\ \downarrow \\ \begin{array}{c} 2^{10} \\ 2^9 \\ 2^8 \\ 2^7 \\ 2^6 \\ 2^5 \\ 2^4 \\ 2^3 \\ 2^2 \\ 2^1 \\ 2^0 \end{array} \end{array}$$

$$\begin{array}{cccccccccccc} 1 & 0 & 1 & 0 & 1 & 1 & 1 & 0 & 1 & 0 & 0 & 1 \\ \downarrow & 2^0 & 2^1 & 2^2 & 2^3 & 2^4 & 2^5 & 2^6 & 2^7 & 2^8 & 2^9 & 2^{10} \end{array}$$

$$(4E9)_{16}$$

$$\begin{array}{c} 1 \\ 2 \leftrightarrow 2 \\ 1 \end{array}$$

$$\begin{array}{c} 1 \\ \dots \\ 2 \end{array}$$

$$(001111001)$$

$$\begin{array}{r} 2 | 1257 \\ 2 | 628 - 1 \\ 2 | 314 - 0 \\ 2 | 157 - 0 \\ 2 | 78 - 1 \\ 2 | 39 - 0 \end{array}$$

10  $\xleftrightarrow{1}$  10  $\xleftrightarrow{2}$

(00111000)

$$2^0 + 2^2 + 2^3 + 2^4 + 2^5 + 2^6 + 2^7$$

2 128-1  
2 39-0  
2 19-1  
2 11-1  
2 4-1  
2 2-0  
2 1-0

100111000

—o—

## # bitmask

int mask<sub>50</sub>  $\rightarrow$  32 bit  $\rightarrow$  4B

00000000	00000000	00000000	00000000
10000110	00010000	10101001	00000000

Leave নিতে আবেদন কিনা?	1
mute করতে " " ?	1
record " " " ?	0

110

—o—

000 $\leftarrow$ 0
001 $\leftarrow$ 1
010 $\leftarrow$ 2
011 $\leftarrow$ 3
100 $\leftarrow$ 4
101 $\leftarrow$ 5
110 $\leftarrow$ 6
111 $\leftarrow$ 7

n অংক  $\rightarrow$  n = বিজোড়

8 70 70

8

n=7

1, 70, 5, 5, 1, 8, 70

n  $\rightarrow$  0 (n)

1 1 5 5 8 70 70

SINGLE NUMBER

$\rightarrow O(n \log n)$

1 1 5 5 8 70 70

XOR

$\begin{array}{cc} A & B \\ 0 & 0 \\ 0 & 1 \\ 1 & 0 \\ 1 & 1 \end{array} \rightarrow \begin{array}{c} A \oplus B \\ 0 \\ 1 \\ 1 \\ 0 \end{array}$

$5 \rightarrow 101$   
 $5 \rightarrow 101$   
 $5 \oplus 5 \rightarrow 000$

$$A \oplus B = B \oplus A$$

$$\begin{aligned} A \oplus B \oplus C &= A \oplus C \oplus B \\ &= B \oplus A \oplus C \\ &= B \oplus C \oplus A \end{aligned}$$

— o —

# Huffman coding

# OS      various scheduling algorithms.

→ Thread, Process