

Maths:

Decimal Binary abs log_x

Agenda:

- ⇒ Decimal number system
- ⇒ Binary number system
- ⇒ Binary to decimal
- ⇒ Decimal to binary
- ⇒ abs, min, max
- ⇒ Range function
- ⇒ log function

⇒ 1.5 hrs

* Decimal Number System:

⇒ (9785634120)₁₀

⇒ 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

\Rightarrow **9843** : $9 \times 1000 + 8 \times 100 + 4 \times 10 + 3 \times 1$
 $\begin{matrix} \swarrow & \downarrow & \downarrow & \downarrow \\ 10^3 & 10^2 & 10^1 & 10^0 \end{matrix}$

Quiz : $10^0 \Rightarrow 1$
 Base⁰ $\Rightarrow 1$

9843 $\Rightarrow 9 \times 10^3 + 8 \times 10^2 + 4 \times 10^1 + 3 \times 10^0$

* **Binary Number System** : (0, 1)

\Rightarrow **Bi** \rightarrow **2** units

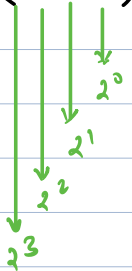
Ex : $(101011)_2$

\Rightarrow **Binary to decimal**

$(101)_2 \Rightarrow 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$
 $\Rightarrow 4 + 0 + 1 \Rightarrow 5$
 $\begin{matrix} \downarrow & \downarrow & \downarrow \\ 2^2 & 2^1 & 2^0 \end{matrix}$

Quiz:

i) $(1111)_2$

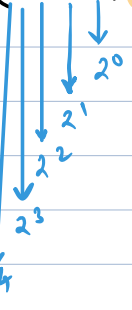


$$\Rightarrow 1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$$

$$\Rightarrow 8 + 4 + 2 + 1$$

$$\Rightarrow 15$$

ii) $(11010)_2$



$$\Rightarrow 1 \times 2^4 + 1 \times 2^3 + \cancel{0 \times 2^2} + 1 \times 2^1 + \cancel{0 \times 2^0}$$

$$\Rightarrow 2^4 + 2^3 + 2^1$$

$$\Rightarrow 16 + 8 + 2 \Rightarrow 26$$

* Decimal to Binary

$$\Rightarrow (19765)_{10}$$

→ Divide it by 10 until we get 0.

10	19765
10	1976
10	197
10	19
10	1
	0

5
6
7
9
1

19765

$$\Rightarrow (25)_{10} \rightarrow (?)_2$$

2	25
2	12
2	6
2	3
2	1
	0

1
0
0
1
1

(11001)₂

$$2 \sqrt{25} \begin{array}{r} 12 \\ 24 \\ 1 \end{array}$$

Quiz

2	26
2	13
2	6
2	3
2	1
	0

0
1
0
1
1

(11010)₂

i) $y = 12345 \% 10$

\Rightarrow convert y to binary?

$\%$ operator gives remainder

$y = 5$

2	5
2	2
2	1
	0

1
0
1

$(101)_2$

\Rightarrow abs \Rightarrow $|x|$ \Rightarrow +ve x

★ Sum of series

Q.) Give sum of all numbers from $1 - 100$. ($n = 100$)

PS: Answer on next page

$$S = 1 + 2 + 3 + \dots + 99 + 100$$

$$S = 100 + 99 + 98 + \dots + 2 + 1$$

$$2S = 101 + 101 + \dots + 101 + 101$$

$$2S = 100 \times 101$$

$$S = \frac{100 + 101}{2} \Rightarrow 50 \times 101 \Rightarrow 5050$$

$$S = \frac{n \times (n+1)}{2}$$

Questⁿ : Sum of no. from 1 to 10

$$S = \frac{10 \times 11}{2} \Rightarrow 55$$

Question) Given a number. How many times you divide it by 2 to reach 1.
integer division

$$\Rightarrow 5 \xrightarrow{1/2} 2 \xrightarrow{1/2} 1 \quad 2 \text{ times}$$

$$\Rightarrow 15 \xrightarrow{1/2} 7 \xrightarrow{1/2} 3 \xrightarrow{1/2} 1 \quad 3 \text{ times}$$

$$\Rightarrow 8 \xrightarrow{1/2} 4 \xrightarrow{1/2} 2 \xrightarrow{1/2} 1 \quad 3 \text{ times}$$

$$\Rightarrow 16 \xrightarrow{1/2} 8 \xrightarrow{1/2} 4 \xrightarrow{1/2} 2 \xrightarrow{1/2} 1 \quad 4 \text{ times}$$

$$2^4 = 16$$

$$2^3 = 8$$

* Log function !

$$i) \log_b^x = y \quad \Rightarrow b^y = x$$

$$ii) \log_2^4 = 2$$

$$x = ?$$

$$\frac{b^y}{2^2} = x \quad 4$$

$$\text{ii) } \log_{10}^{100} = \text{?} \Rightarrow 2$$

$$\begin{aligned} b^x &= x \\ 10^1 &= 100 \\ 10^2 &= 100 \end{aligned}$$

$$\text{iii) } \log_2^1 = 0 \quad x = ?$$

$$\begin{aligned} b^x &= x \\ 2^0 &= 1 \end{aligned}$$

$$\text{iii) } \log_2^2 = 1 \quad 2^1 = 2$$

$$\text{iii) } \log_2^4 = 2 \quad \begin{aligned} b^x &= x \\ 2^2 &= 4 \end{aligned}$$

$$\text{iii) } \log_2^8 = 3 \quad x = ?$$

$$\text{iv) } \log_2^{16} = 4$$