

Learn why problem.
problem \rightarrow identify (+ve) observations.

Q1 Given a number, find the count of factors of the number.

$$N = \underline{10} : 1, 2, 5, 10$$

$$\Rightarrow \underline{24} : \underline{1, 2, 3, 4, 6, 8, 12, 24}$$

x is a factor of N ?

$$\frac{N}{x} = 0$$

remainder

```

int getFactor( N )
{
    int c = 0;
    for ( i = 1 ; i <= N ; i++ ) {
        if ( N % i == 0 )
            c++;
    }
    return c;
}

```

iterations?
 $i \rightarrow [1, N]$
 N times.

Assumption: 10^8 iteration in 1 sec.

$$N = \underline{10^8} \rightarrow 10^8 \text{ iteration} \rightarrow \underline{1} \text{ sec.}$$

$$N = \underline{10^9} \rightarrow \frac{10^9}{10^8} \rightarrow \underline{10 \text{ sec.}}$$

$$1 \rightarrow 10^0$$

$$\frac{10 \times 10^0}{1}$$

$$\boxed{N = \underline{10^{18}}} \rightarrow 10^{18} \text{ iteration}$$

$$\begin{aligned}
 10^8 &\rightarrow 1 \text{ sec} \\
 10^{18} &\rightarrow \frac{10^{18}}{10^8} \rightarrow 10^{10} \text{ sec.} \\
 &\rightarrow \approx \underline{\underline{317 \text{ years}}}.
 \end{aligned}$$

you \rightarrow Kids \rightarrow grandKids \rightarrow 4^{th} Gen \rightarrow 5^{th} gen

// Optimisations

if a, b, N are the integers (+ve)
& $a * b = N \Rightarrow b = \frac{N}{a}$
 $[a, b]$ are factors of N

$[a, \frac{N}{a}]$ are factors of N

↳ If a is a factor of N

↳ $\frac{N}{a}$ is also a factor of N .

$N = 24$	
i	N/i
1	24
2	12
3	8
4	6
6	4
8	3
12	2
24	1

$N = 100$	
i	N/i
1	100
2	50
4	25
5	20
10	10
20	5
25	4
50	2

$$\begin{array}{c|c} \overline{12} & \overline{2} \\ \hline 24 & 1 \end{array}$$

factors
of N

\leq, \geq
if $a \leq 57$
 $a_{\max} \rightarrow 57$

$$\begin{array}{c|c} \overline{100} & 1 \\ \hline 1 & 1 \end{array}$$

$$\underline{i} \leq \frac{N}{\underline{i}}$$

$$\max \underline{i} = \frac{N}{\underline{i}}$$

$$\underline{i} * \underline{i} = N$$

$$\underline{i} = \sqrt{N}$$

$$\underline{\sqrt{24}} = \underline{4.8\dots} \quad \boxed{5}$$

$$= \underline{\text{float}()}$$

$$\underline{N = 100},$$

$$\underline{\sqrt{N}} = 10$$

$$\underline{i \leq 10}$$

$$\underline{i \leq 4}$$

```

int getfactor(N)
{
    int c = 0;
    for (i = 1; i <= sqrt(N); i++)
    {
        if (N % i == 0)
        {
            if (i * i == N)
                c += 1;
            else
                c += 2;
        }
    }
    return c;
}

```

$\underline{i * i \leq N}$
 $\underline{i \leq \sqrt{N}}$
 $\underline{i \leq 10}$
 $\underline{i \leq 4}$

$\underline{N = 24}$
 $\underline{i = 3}$ $\underline{N \% i = 8}$
 $\underline{i = 7}$ $\underline{N \% i = 7}$

No. of iterations

$i \rightarrow [1, \sqrt{N}]$

$$\cancel{N = 10^{18}} = \sqrt{10^{18}} = 10^9 \text{ iterations}$$

$\underline{\underline{= 10 \text{ secs.}}}$

20 mins.

→ write the doubts

→ think.

google / stack /

ask TA/me/

$$\text{Q.} \quad 1 + 2 + 3 + 4 + \dots + 100 \Rightarrow \frac{N(N+1)}{2}$$

Carl Friedrich Gauss

(4th class)

$$1 + 2 + 3 + \cdots + 99 + 100$$

A diagram illustrating the sum of integers from 1 to 100. The numbers are arranged in a row: 1, 2, 3, ..., 99, 100. Each number is represented by a green arrow pointing upwards. The total length of all these arrows is labeled "101" at the bottom center.

$$2S = \underbrace{101 + 101 + 101 + 101 + \dots + 101 + 101 + 101 + 101}_{100 \text{ number}}$$

$$2S = 100 * 101$$

$$S = \frac{100 * 101}{2} = \underline{\underline{5050}} \quad \leftarrow \boxed{\text{Observations}}$$

$$\underline{S} = 1 + 2 + 3 + \dots + N-1 + N$$

$$S = N + N-1 + \dots + 2 + 1$$

$$\underline{2S} = (N+1) + (N+1) + \dots + (N+1) + (N+1)$$

$$2S = N * (N+1)$$

$$\boxed{S = \frac{N(N+1)}{2}}$$

Q. Given N , how many times we need to divide it by 2 till it becomes 1. $\frac{\downarrow}{\text{integer}}$

$$N=7 \xrightarrow{7/2} 3 \xrightarrow{3/2} 1 \quad [\text{Ans} = 2]$$

$$N=1 \xrightarrow{\quad} 0$$

$$N=2 \xrightarrow{\quad} 1$$

$$N=4 \xrightarrow{4/2} 2 \xrightarrow{2/2} 1 \xrightarrow{\quad} 2$$

$$N=8 \xrightarrow{8/2} 4 \xrightarrow{4/2} 2 \xrightarrow{2/2} 1 \xrightarrow{\quad} 3$$

$$N=32 \xrightarrow{\quad} 5$$

$$\Rightarrow \boxed{N=27} \xrightarrow{27/2} 13 \xrightarrow{13/2} 6 \xrightarrow{6/2} 3 \xrightarrow{3/2} 1 \Rightarrow \boxed{4} \Rightarrow 2^4$$

$$N=19 \xrightarrow{19/2} 9 \xrightarrow{8/2} 4 \xrightarrow{4/2} 2 \xrightarrow{2/2} 1 \Rightarrow \boxed{4} \cdot 2^4$$

$\boxed{11 \cdot 11 \cdot 11}$

my 2¹ v
floor

$$\log_2 4 \Rightarrow 2$$

$$\log_2 32 \Rightarrow 5$$

$$\log_2 27 \Rightarrow 4. xyz$$

$$2^4 = 16$$

$$\boxed{4 \cdot xyz} - \boxed{2} = \boxed{27}$$

$$2^5 = 32$$

$$\log_2 1024 \Rightarrow 10$$

$$\underline{\underline{2^{10} = 1024}}$$

$$2^3 = 8$$

$$\underline{\underline{2^{3.4} = 13}} \rightarrow$$

$$2^4 = 16$$

$$\underline{\underline{\log_2 13}} = \boxed{3 \cdot xyz}$$

$$N \Rightarrow \lfloor \log_2 N \rfloor$$

Maggi \rightarrow Break (0: 10 pm)

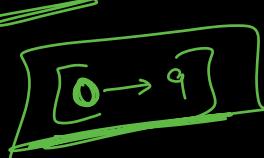
Doubts

$$\log_{10} 50$$

$$10^x = 50$$

Search how $\log(N)$.

$$\log_{10} 100 \Rightarrow 2$$



1. 2

$$100 \xrightarrow{10/10} 10 \xrightarrow{10/10} 1$$

$$\frac{50}{10} = \boxed{5} \xrightarrow{5/10} \boxed{0}$$

1 ... abc

$$\log_{10} 50 \Rightarrow \underline{\underline{5}}.$$

$$\log_{10} 50 \Rightarrow x \Rightarrow \underline{\underline{10^x = 50}}$$

rend \rightarrow $(5) \xrightarrow{5/10} \boxed{0}$

$$10^2 = 100$$

$$10^x = 50$$

$$10^1 = 10$$

$$x = 1.7$$

$$\log_2 x. \quad \underline{\underline{[0, 1]}}. \quad 10 \rightarrow \underline{\underline{[0 \rightarrow 9]}}$$

$$\log_{15} x. \rightarrow \underline{\underline{[0, \rightarrow 14]}}$$

Amazon. Q. Given a "perfect square". Find the Sq. root of the number. (+ve)

Perfect Sq \rightarrow N is a perfect sq
if \sqrt{N} is an integer.

i.e. there exists an integer x

$$\underline{\underline{x * x = N}}$$

$$N = 25 \rightarrow \boxed{\underline{\underline{5}}}$$

$$N = 100 \rightarrow \boxed{\underline{\underline{10}}}$$

$$\sqrt{N} \rightarrow \underline{\underline{[1, N]}}$$

$\nearrow > N \times$
 $\searrow < 1 \times$

sqt(N)?

```

    "                                , → 2b4
int sqrt(N)
{
    for ( i=1 ; i<=N ; i++ )
        if ( i*i == N ) ←
            return i;
}

```

iterations ↓

$N =$	36
i	$i * i$
1	1
2	4
3	9
4	16
5	25
6	36

i	$i \times i$
1	1
2	
3	
:	
10	100

~~What if $N = 21, 50, 99$?~~

$$N = 2^{32} \longrightarrow 2^{16} \text{ iterations.}$$

10^8 iterat \rightarrow 1 sec

$$2^{16} \text{ iteret} \rightarrow ?$$



$$\approx \frac{10^3 * 2^6}{}$$

$$2^{10} = 1024$$

\approx 10³

$$N = 2^{64} \rightarrow 2^{32} \text{ iteration} = (2^{10}) * (2^{10}) * (2^{10}) * 2^2$$

$$\approx \frac{(10^3) * (10^3) * (10^3) * 2^2}{10^8} \approx 40 \text{ sec}$$

\sqrt{N} → Ans → $[1, N]$ Binary Search
 $\text{sq. root is always present in this range.}$

$$N = 100$$

$$[1, 100]$$

Centre

$$\frac{50 * 50}{\downarrow} > 100$$

$$1, 2, \dots, 49, \underline{50}, 51, 52, \dots, 100$$

$$[1, 49]$$

$$25 * 25 > 100$$

$$1, 2, \dots, 24, \underline{25, 26, \dots, 49}$$

$$[1, 24]$$

$$12 * 12 > 100$$

$$1, 2, \dots, 11, \underline{12, 13, \dots, 24}$$

$$[1, 11]$$

$$6 * 6 < 100$$

$$1, 2, \dots, 5, \underline{6, 7, 8, \dots, 11}$$

$$[7, 11]$$

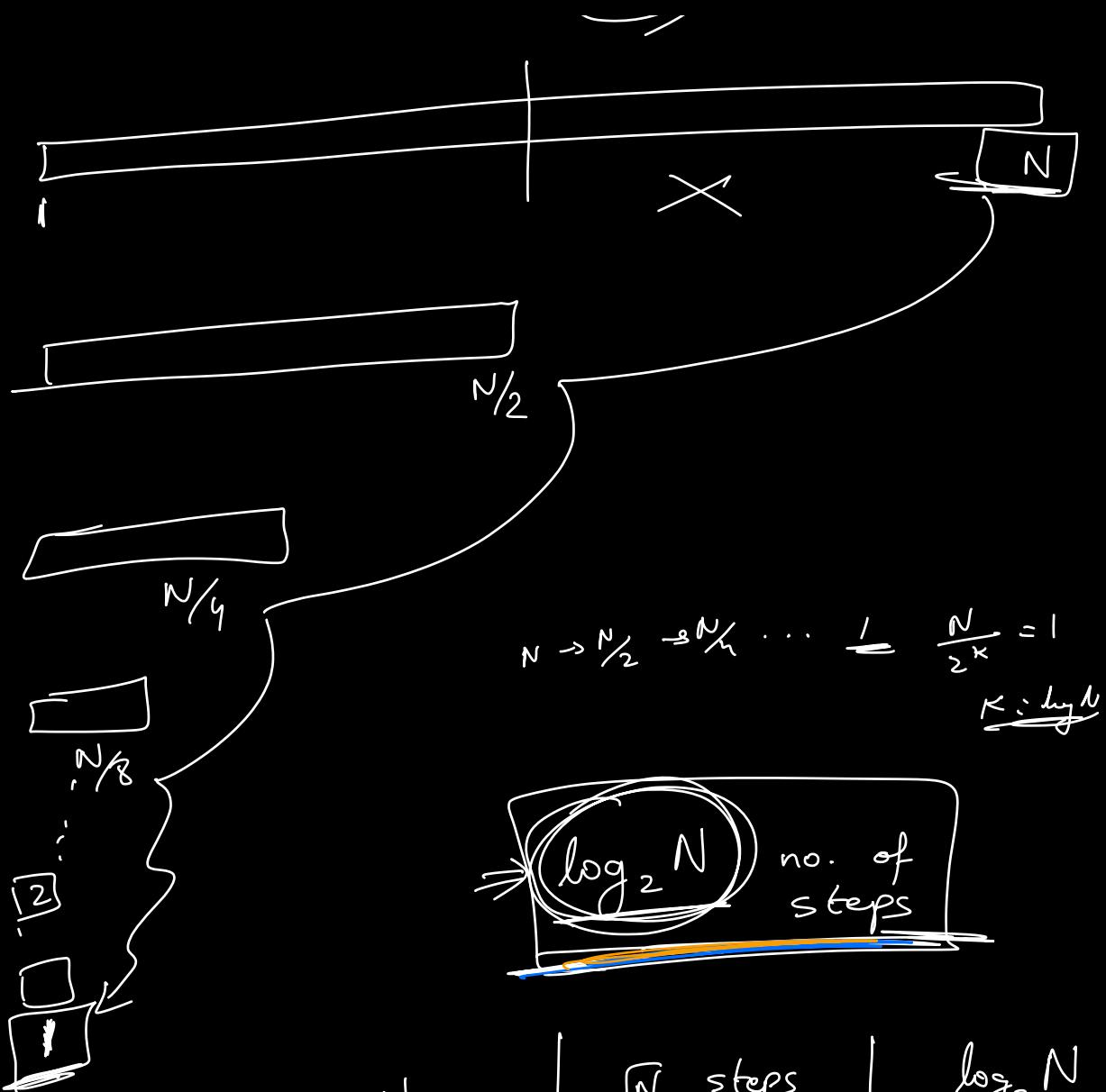
$$9 * 9 < 100$$

$$7, \underline{8, 9, 10, 11}$$

$$[10, 11]$$

$$10 * 10 = 100$$

Aus

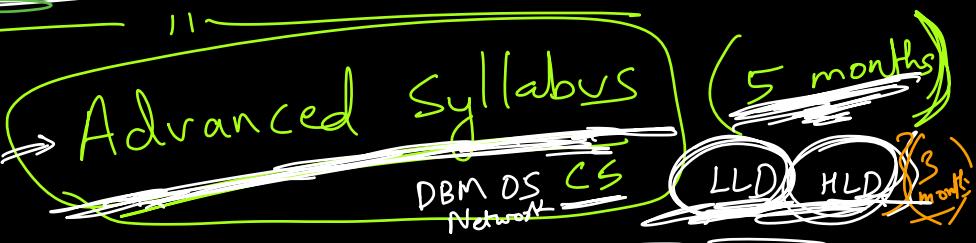


N	\sqrt{N} steps	$\log_2 N$ steps
$N = 1024$	32	10
$N = 2^{32}$	2^{16}	32
$N = 2^{64}$	2^{32}	64

Binary Classification \rightarrow ②

~~(2 months)~~ Content of Intermediate Module → (DSA)
(Intro to problem solving)

- ① ~~Time Complexity & Space Complexity~~ — 2
- ② ~~Arrays (Problem pattern)~~ — 6
 - Intro to Arrays
 - Prefix Sum
 - Carry forward
 - Subarray / Sliding Window / Contribution technique
 - 2D Matrix
 - Interview problems.
- ③ ~~Bit Manipulation~~ — 2
- ④ ~~Math & Array~~ — 2
- ⑤ ~~Sorting / HashMap / String~~ — 4
- ⑥ ~~Recursion~~ — 2
- ⑦ ~~Subsets / subseq~~
- ⑧ ~~Linked Lists (Basic)~~
- ⑨ ~~Stack (Basic)~~
- ⑩ ~~Binary Trees~~ — 2



Doubts

mail ⇒ support@scalar.com

Only ↑ to become good at observ

~~Solve more problems~~