Today's Special

- Prime Numbers
- Quizes
- Sqrt
- linked In influencer level speeches
- Next 2 Months topics & schedule

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2 Months

N, 1 & itself are factors, won't hold if N = 1

① – factors : 1, Not a prime

N >= 1, No: of factors = 2

```
bool isPrime(N){
    cnt = 0
    for(i=1; i<=N; i++){
        if(N%i == 0){
            cnt++;
        }
    }
    if(cnt == 2){
        return True
    }
    else return False
}
```

Assumption :

10^8 iterations in 1 sec

Input :	Iterations	Execution Time
$N = 10^9$	10^9 iterat	10 sec
$N = 10^{18}$	10^{18} iteration	10^{10} sec

10^8 iterat – 1 sec

10^{18} iterat – n

$n \times 10^8 = 1 \times 10^{18}$

$n = \frac{10^{18}}{10^8} = 10^{18-8} = 10^{10}$ sec

$\frac{a^m}{a^n} = a^{m-n}$

10^{10} sec → hours → days → years : 317 years

1)

$a * b = N$, $b = N/a$

Both (a & b) factors of N

(a, N/a) factor of N

If a is factor of N

N/a is also a factor

2) Relational operators

$<$, $>$, $<=$, $>=$

$==$, $!=$

3) a & 10

Max a = 10

$a^2 = N$

Max a = N

$N = 24$

i	N/i	
1	24	Part-I
2	12	
3	8	
4	6	
6	4	Part-II
8	3	
12	2	
24	1	

$N = 100$

i	N/i	
1	100	Part I
2	50	
4	25	
5	20	
10	10	
20	5	
25	4	
50	2	
100	1	

Part I

$i^2 = N/i$

To get i

$i^2 = N/i$

$i^2 = N$

Sqrt on both

$i = \sqrt{N}$

obs1: If we iterate on Part I we can get all factors of N.

obs2: In part I i = 1

obs3: In part I max i = $\sqrt{N}$ } [1 $\sqrt{N}$]

If N is prime

[1 N] How many factors = 2

[1 $\sqrt{N}$] How many factors = 1

[2 $\sqrt{N}$] How many factors = 0

[1 10] = 10

[3 14] = 14 - 3 + 1 = 12

[a b] = b - a + 1

for input N → [2, $\sqrt{N}$]

Iterations → $\sqrt{N} - 1 \approx \sqrt{N}$

```
isPrime ( N ) {
    bool ch = True;
    if ( N == 1) return False
    i = 2; i <= √N; i++) {
        if ( N % i == 0) {
            ch = False; break
        }
    }
    return ch;
}
```

Input N	Iterations	Exact
10^{18}	10^9	1 sec

317 years → 1 sec

1 sec = 10^8 iterations Ans

$\sqrt{101} = 10.01 \approx 10$

→

28)

Sum of first 100 Natural Numbers = ? $\frac{(100)(101)}{2} = 5050$

$$S = 1 + 2 + 3 + 4 + 5 + \cdots + 98 + 99 + 100$$
$$S = 100 \quad 99 \quad 98 \quad 97 \quad 96 \quad \cdots \quad 3 \quad 2 \quad 1$$

$$2S = 101 + 101 + 101 + 101 + 101 + \cdots + 101 + 101 + 101$$

$$2S = (100)(101), \quad S = \frac{(100)(101)}{2}, \quad S = (50)(101)$$

{ Gauss

Sum of first N Natural Numbers $= \frac{(N)(N+1)}{2}$

$$S = 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad \cdots \quad N-2 \quad N-1 \quad N$$
$$S = N \quad N-1 \quad N-2 \quad N-3 \quad N-4 \quad \cdots \quad 3 \quad 2 \quad 1$$

$$2S = (N+1)\ (N+1)\ (N+1)\ (N+1)\ (N+1) - \cdots - (N+1)\ (N+1)\ (N+1)$$

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

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

Quiz: 5 10:15 PM] $15/2 = 7$ | $25/2 = 12$

Given N, how many times we need to divide by 2 to make it 1. ≈ $\log_2^N$

2 → 1 : 1 = $\log_2^{2^1}$

4 → 2 → 1 : 2 = $\log_2^{2^2}$

8 → 4 → 2 → 1 : 3 = $\log_2^{2^3}$

9 → 4 → 2 → 1 : 3 = $\log_2^9$

10 → 5 → 2 → 1 : 3

15 → 7 → 3 → 1 : 3 = $\log_2^{15}$

27 → 13 → 6 → 3 → 1 : 4 = $\log_2^{27}$

$\log_a a^n = N$ ✓

$\log_2^{2^5} = 5$

$\log_2^{2^N} = N$

$\log_2^9 = 3.16925$

$\log_2^{27} = 4.7548$

$\log_2^{15} = 3.9068$

TODO: { Plean learn What's log }

Perfect Square:

N →

Perfect Square (Amazon)

Given {N (Perfect Square)}

find it's Sqrt N > 0

N = 100 → 10

N = 25 → 5

N = 20 →

```
Sqrt( N) {                          [1, √N] : √N
    for(i=1; i<=N; i++){
        if( i*i == N){
            return i;
        }
    }
}
```

→ 25

a) N

b) N/2

c) √N ✓

d) logN

N = 100

i = 10, 10*10 = 100, return 10

N = 36

i = 6, 6*6 = 36, return 6

N = 64

i = 8, 8*8 = 64 return 8

N = 100 { ≡ }

center:

[1 ↓ 100] : 100 → 50 } 50*50 > 100 [51, 52, 53 . . 100]

[1 ↓ 49] : 49 → 24 } 24*24 > 100 [25, 26, 27 -]

[1 ↓ 23] : 23 → 11 } 11*11 > 100 [12, 13, 14 - -]

[1 ↓ 10] : 10 → 5 } 5*5 < 100 [4 3 2 1]

[6 ↓ 10] : 5 → 8 } 8*8 < 100 [7 6]

[9 ↓ 10] : 2 → 9 } 9*9 < 100 [9]

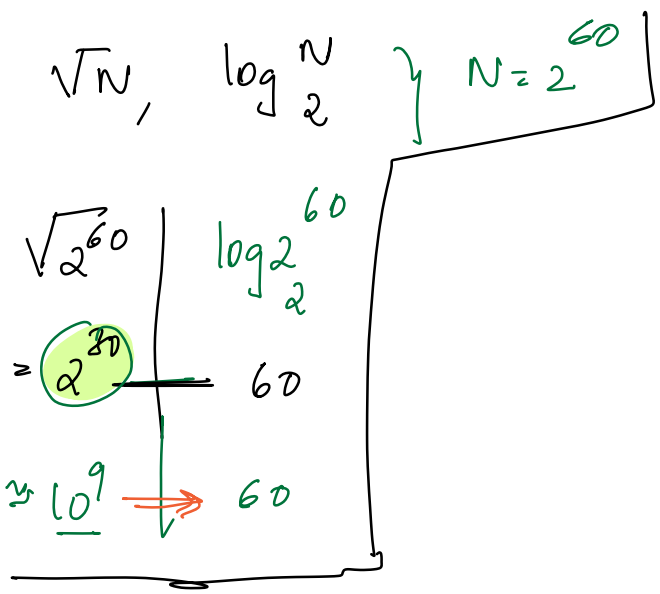
[10 ↓ 10] : 1 → 10 } 10*10 = 100

[1 ↓ N]

N/2 N/2

Iterations

$N \to N/2 \to N/4 \to N/8 \cdots \approx 1 \Rightarrow \log_2 N$


$\sqrt{N}$, $\log_2 N$
$N = 2^{60}$
$\sqrt{2^{60}}$
$\log_2 2^{60}$
$= 2^{30}$
60
$\approx 10^9$
60

Undo/ Redo ⟵ ⟶ } Stack

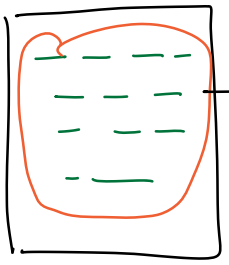
Autocomplete

Money
bike
onday
} Trie

Facebook : Mutual friends
BFS (Breadth)

Google Maps : Dijkstra's Algo

Word Pad



→ Dynamic Programming

1) knowing

2) Where to use

Intermediate Batch → Tricks / Utilities

1) Bit Manipulations : 2
2) Time Complexity : 2
3) Arrays : 8 sessions
4) Hashing / Strings : 4
5) Recursion : 3
6) Subset / Subsequence : 2 sessions
7) Oops : 2/3

→ Language Independent
→ Tues / Thurs / Satur
→ 9PM

9PM - 10:20PM
10:20PM - 10:30 break
10:30 PM - 11:20 PM

11:20PM - 12 AM (Doubts)

→ PDF, with everyone (Dashboard)

→ ≈ 6 assignment Problems }

→ Weekly ≈ 20 ↦ Homework

→ 8/9 Weeks ≈ 160 - 180 ≈ 150 Classwork

→ Assignment → Doubts

1) Self Debug

TA (Teaching Assistant)

Ask Me

Session Doubt / Concept

1) Ask Session

2) Doubt Session

3) Ping Me in Slack

Doubts: }