Welcome
Monday, 12 September 2021 6:02 PM

Today's Special
Quiz 1 & Quiz 2
- Prime Numbers
- Quiz 2
- Sqrt
- Inkedin influencer level speeches
- Next 2 Months topics

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$N \geq 1$

Prime → N, if only 1 & itself factors } Prime: 2 factors
N=1 } 1 — N
No: of factors = 2 } 23: 1, 23 = 2

N=10

```
isprime ( N ) {
    for i=0
    for ( I=1; I<=N; I++){
        if ( N % I == 0){
            C++;
        }
    }
    if ( C == 2)
        return true
    else return false
}
```

Assumption:
10^8 iterations — 1 sec } isappl — 25 m
$N=10^9$ 10^9 iterations — 10 sec } isappl — x
$N=10^{10}$ 10^{10} iterations — 10^2 sec
$x \times 25 = 8 \times 25 \times 5$
$x = 40$
317 years

Theory

optimization
$a^* b = N$, $b = N/a$
(a, b) are factors
(a, N/a) are factors
a, b after N/a } also factor
Relational operators ✓
$<, >, <=, >=, ==, !=$
$a <= 25$ Max $a = 25$
$a >= 25$ Min $a = 25$

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

Sort I

N=100

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

Sort I

$\sqrt{57} = 6.13$

```
if (N==1) return false
for i=2; i<=√N; i++
    if (N % i == 0)
        return false
return true
```

A number N is prime if it has no factors from [2, √N] Statement

```
if (N==1)
    return true
```

N → approx: $\sqrt{N}$ iterations
10^8 = 10^9 iterations : 10 sec

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

→ Sum of first N Whole Numbers
0, 1, 2, 3, ... N-1
Sum of N-1 Natural Numbers = $\frac{(N-1)(N-1+1)}{2}$
→ $\frac{(N-1)(N)}{2}$

Shagufta: 1, 2, 3, 4, 5 .. 100

S	1	2	3	4	5	...	98	99	100
+	100	99	98	97	96		3	2	1
S	101	101	101	101	101	...	101	101	101

2S = 101 * 100 Gauss

$S = \frac{101 * 100}{2}$

S =	1	2	3	4	5	..	N-2	N-1	N
+ S =	N	N-1	N-2	N-3	N-4		3	2	1
2S =	(N+1)	(N+1)	(N+1)	(N+1)	(N+1)		(N+1)	(N+1)	(N+1)

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

→ Integer Division
$5/2 = 2$ $7/2 = 3$

$\log_2 10 = 10$, $\log_a a^n = n$

Given N, How many times we need to divide by 2, to make it 1

$2^1 : 2 \to 1$: count 1 : $\log_2 2$ ✓
$2^2 : 4 \to 2 \to 1$: 2 : $\log_2 2^2$ ✓
$2^3 : 8 \to 4 \to 2 \to 1$: 3 : $\log_2 2^3$ ✓
$8 \to 4 \to 2 \to 1$: 3 : $\log_2 8$ = 1.99 ≈ 3
$15 \to 7 \to 3 \to 1$: 3 : $\log_2 15$ = 3.906 ≈ 3
$2^4 : 16 \to 8 \to 4 \to 2 \to 1$: 4 : $\log_2 2^4$
$30 \to 15 \to 7 \to 3 \to 1$: 4 : $\log_2 30$ = 4.906

$N, \to 1$: $\lfloor \log_2 N \rfloor$
Integral part of $\log_2 N$
Integer

N2=0
Given perfect square find sqrt
N=16 → 4, N=25 → 5
100 → 10

```
sqrt ( N ){
    for i=1; i*i<=N; i++{
        if ( i*i == N){
            return i
        }
    }
}
```

Iterations: a) N times
b) N/2 ...
c) sqrt(N)

N = 100 : 1, 2, 3, ... 10
N = 400 : r = 20
N = 81 : r = 9
N : $\sqrt{N}$
[1, √N] : √N
$N = 2^{20}$: 2^{10}

Binary Search {optimize}

mid

N = 100?
[1 ——— 100] = 100 } $50 * 50 > 100$ } 51 52 53 ——— ✗
[1 ——— 49] : 50 } $25 * 25 > 100$ } 26 27 28 ... ✗
[1 ——— 24] : 25 } $12 * 12 > 100$ } 13 14 15 ✗
[1 ——— 12] : 12 } $6 * 6 < 100$ } 1 2 3 4 5 ✗
[7 ——— 12] : 6 } $7 * 7 < 100$ } 7 8 9 ✗
[10 ——— 12] : 10 * 10 = 100

= $\log_2 N$
$N = 2^{20}$
20

[1 ——— N]
[N/2] [N/2]
N/4 N/4

N → N/2 → N/4 → N/8 → 1
$\log_2 N$
Iteration
N

Undo/Redo : Doubly Stack
← | →

Autocomplete : Tries

Facebook → { Mutual friends } : BFS graph

Google Maps: Dijkstra's Algo

Twitter : Filter based on rates
rating in increasing order
Sorting algo

Word Ladder: Dynamic Programming

→ ? Interviews?
2 Months : ?
: questions : Bit Manipulations ✓
: TLE : Time Complexity/
Space Complexity
Arrays : 5 sessions

Hackmap / :
Maths
Strings / Sorting
Mathematic Induction

Recursion
Backtracking
Dynamic Programming
Divide & Conquer

Weekly 3 Sessions M/W/F
7 PM — 11:30 PM doubts 12 PM
5/10 min break
Not a computer to stay

✓ Share pdf
✓ Basic math — will share
↳ log/ → 6-7
↳ Sum of GP } Geometric progression
✓ Doubts: last 20 min
↳ conceptual doubts : I will explain
↳ Coding doubts
debug on any | T4 | Slack

Revision