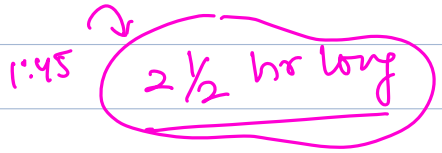
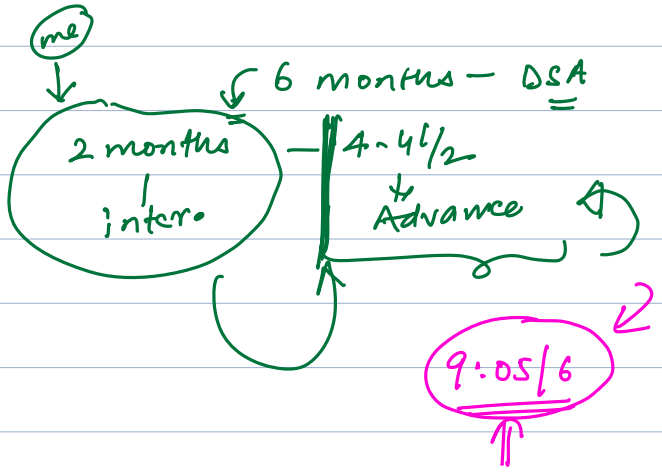
Intro to Problem Solving

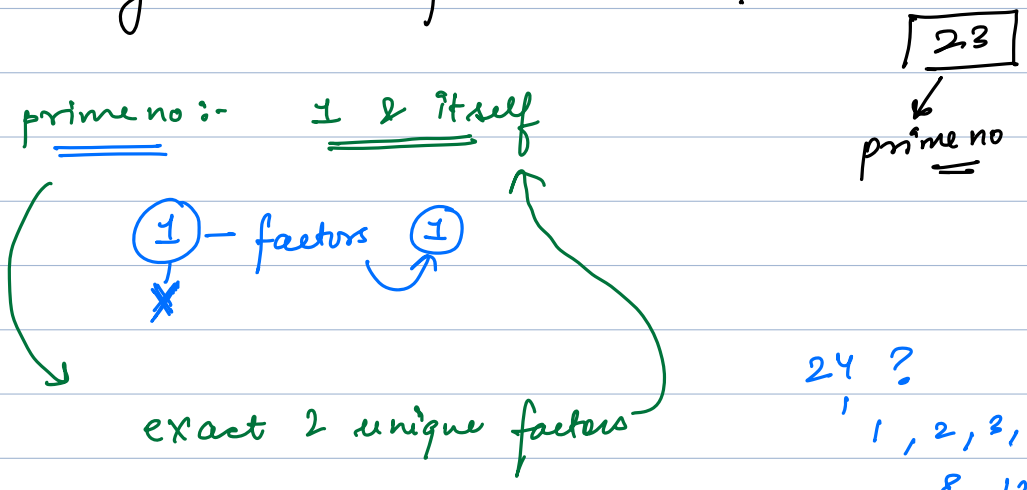
22 June 2022

We'll start with introduction at 9:05 pm.





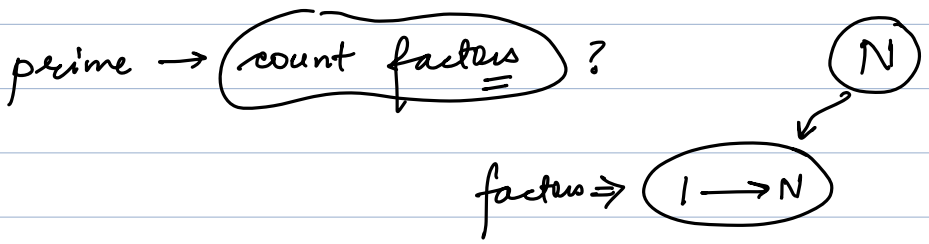
- check if a given no is prime or not!



2 5 11
3 7 13 . . . .

24 ?
1, 2, 3, 4, 6, 8, 12, 24

6
1, 2, 3, 6




```
int cnt=0;
for( int i=1; i<=N; i++)
{
    if( N%i==0)
        cnt++;
}
if (cnt==2)
    print("prime");
```

remainder

N / i remainder → 0

1 sec = 10^8 iterations

$N = 10^9$ iterations

10^9

1 sec = 10^8 iterations

1 itera = $\frac{1}{10^8}$ sec

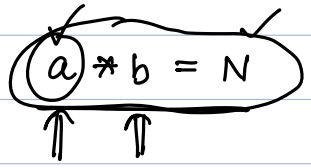
10^9 iter = $\frac{10^9}{10^8}$ = 10 sec

$N = 10^{18}$

1 iter = $\frac{1}{10^8}$ sec

$10^{18} \simeq \frac{10^{18}}{10^8} = 10^{10}$ sec ⇒ years?

$\simeq$ 317 years



$b = N/a$

$a, N/a$

24

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

$1 * 24 = 24$

① Factors occur in pair

$i \le N/i$

$i_{max} = N/i$

$i * i \le N$

② $i \le \sqrt{N}$

$a \le 57$

$a_{max} = 57$

If you just go from $1 \to \sqrt{N}$, you can get each & every factor

45

$i * i \le N$

$i * i \le 45$

$i = 1$	1	$45/1$
$i = 2$		
$i = 3$	3	$45/3 = 15$
$i = 4$		
$i = 5$	5	$45/5 = 9$
$i = 6$		

$1 * 45$

$3 * 15$

$5 * 9$

$9 * 5$

$15 * 3$

$45 * 1$

```
for (int i=1;  i*i<=N; i++)
{
    if (N%i==0)
    {
        cnt++;   → // if i, N/i
                   // i is a factor
        if(i!=N/i) cnt++;
    }
}

if (count==2)
    Yes, prime no
```

36

1	36	cnt+=2
2	18	cnt+=2
3	12	cnt+=2
4	9	cnt+=2
6	6	cnt+=2

only for perfect square

$1 \longrightarrow N$

$1 \longrightarrow \sqrt{N}$ — $\sqrt{N}$ iterations

$N = 10^9$

$10^3 * 10^3 = 10^6$

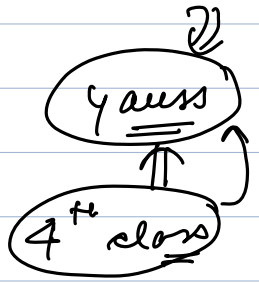
1 iter = $\frac{1}{10^8}$ sec

$N = 10^9 \rightarrow \sqrt{N}$ $10^{9/2}$ $\sqrt{10^9} = \frac{\sqrt{10^9}}{10^8}$ sec $= \frac{10^5}{10^8} = 10^{-3}$ sec

$N = 10^{18}$ $\sqrt{N}$ 10^9 10^9 iter $= \frac{10^9}{10^8}$ sec $=$ 10 sec

3:19

$\{1 + 2 + 3 + 4 \ldots + 100\}$



$$S = 1 + 2 + 3 + 4 + \ldots + 100$$

$$S = 100 + 99 + 98 + 97 + \ldots + 1$$

$+$

$$2S = [101 + 101 + 101 + \ldots + 101]$$

$$2S = 100 * 101$$

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

$$S = 1 + 2 + 3 \ldots + N$$

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

$$2S = (N+1) + (N+1) + (N+1) + (N+1) \ldots \} N \text{ times}$$

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

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

sum from $1 \rightarrow N$

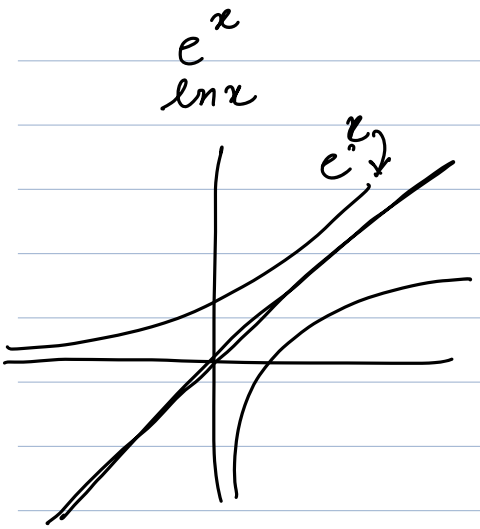
Given N. In how many step you can reduce N to 1 ? divide by 2

$27/2 = 13/2 = 6/2 = 3/2 = 1$

4

$N \to N/2 \to N/4 \to N/8 \cdots\cdots 1$

$\log_2 N$ (integer part)



$N = 2^x$ $\quad x = \log_2 N$

$16 = 2^x \quad x = 4$

$27 = 3^x \quad x = 3$

$x = \log_3 N$

HW = $\log_2 N$

$\log_a b$ = How much power of a should I raise get b

$a^{\square} = b$

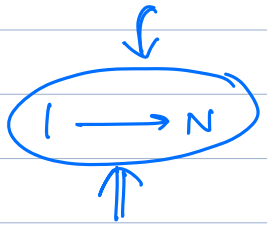
$64/2 = 32/2 = 16/2 = 8/2 = 4/2 = 2/2 = 1$

32

$1 * 2 = 2 * 2 = 4 * 2 = 8 * 2 = 16 * 2 = 32 = 2^5$

$1 = 2/2 = 4/2 = 8/2 = 16/2 = 32/2$

Q find square root of a perfect square N!



N = 100

10 * 10 = 100

N is ps

```
for( i=1→N)
{
    if( i*i == N)
        return i;
}
```

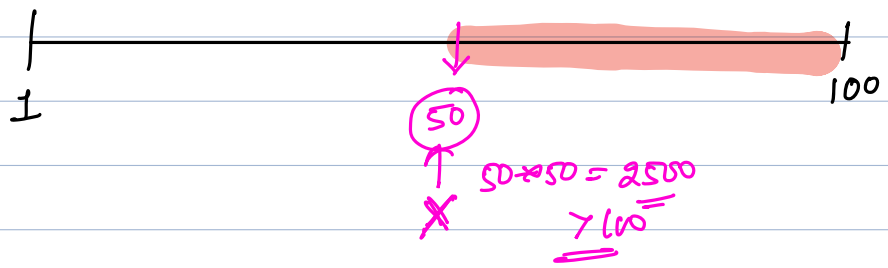
1 → √N ← N

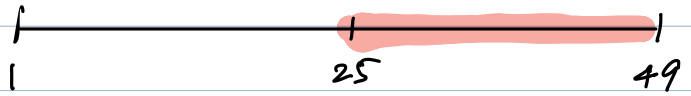
√N iteration

i =			
	1	7	100
	2	8	
	3	9	
	4	10	
	5		
	6		

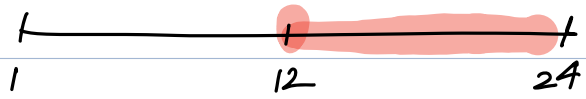
$N = 10^{10}$ $= 10^{32}$ | 10^5 10^{16} iter

N = 100

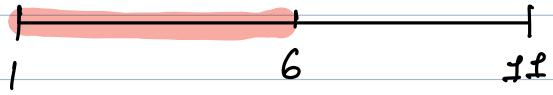




25 * 25 = 625 > 100

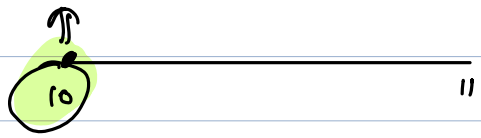


$12 * 12 = 144 > 100$

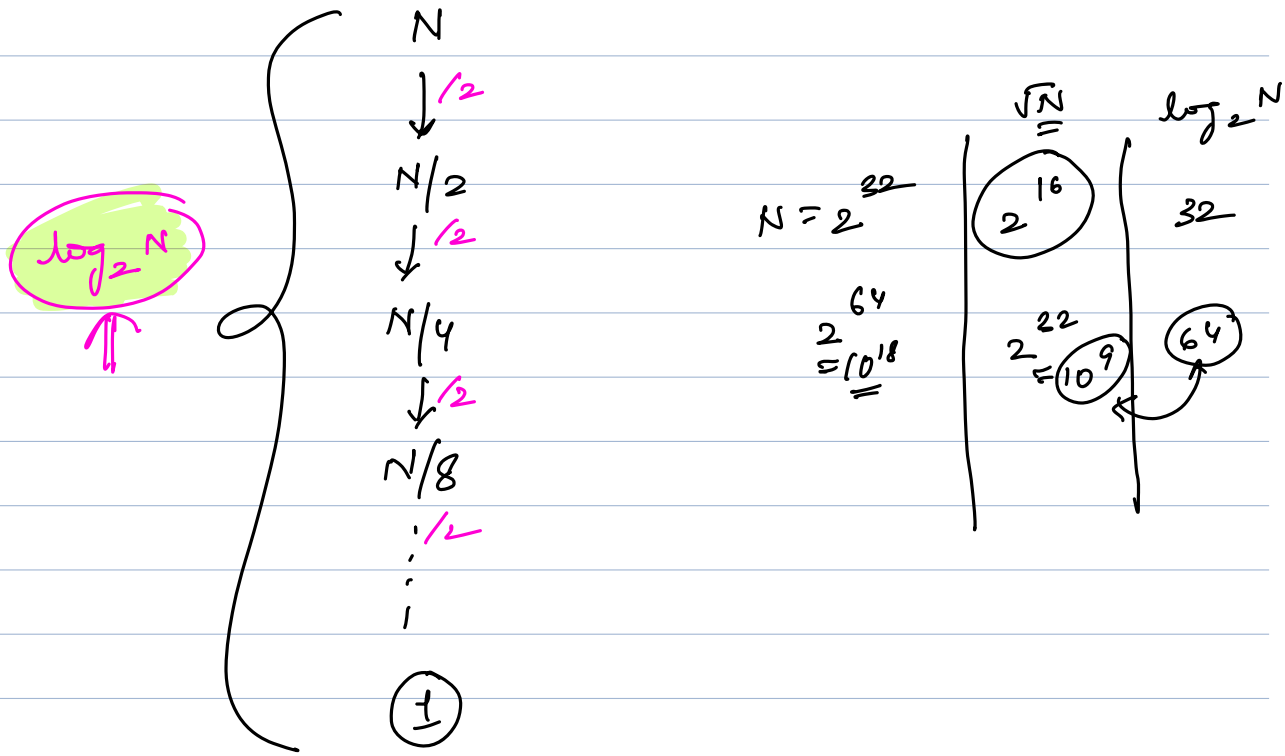


$6 * 6 = 36 < 100$

$9 * 9 = 81$



$10 \times 10 = 100$



Yes Observations are Important! ☺

Time complexity - 1 & 2

whatsapp group

Arrays
- Arrays
- Prefix sum
- Carry forward
- SubArrays
- 2D Matrix
- Interview prob

- peer group
- TA
- slack
- mohit.sharma@scaler.com
- 2-3 days
- DM
- 9:05 pm

- Bit manipulation - 1, 2, 3

- Modular Arithmetic
- Array & Matrix

- Sorting
- strings

- Hashmaps - 1 & 2

- Recursion 1 & 2

Stack & queue - 1

LL - 1

Trees - 2

Sub & sub - 1

zero

0 = $\frac{2}{3} = \frac{7}{3} = \frac{21}{3} = \frac{64}{3}$

$3^4 = 81$

$\log_3 64 \approx 4$

8-