

- 1) Why problem solving is important.
- 2) Good problem solver
- 3) Examples
- 4) Doubts

ML / DS

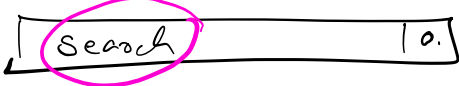
Backend

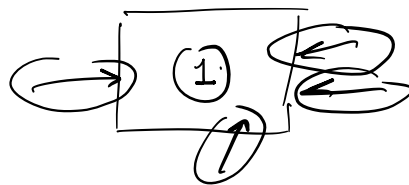
Frontend

20 years ()

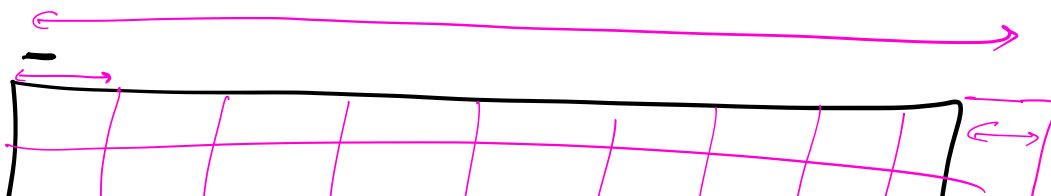


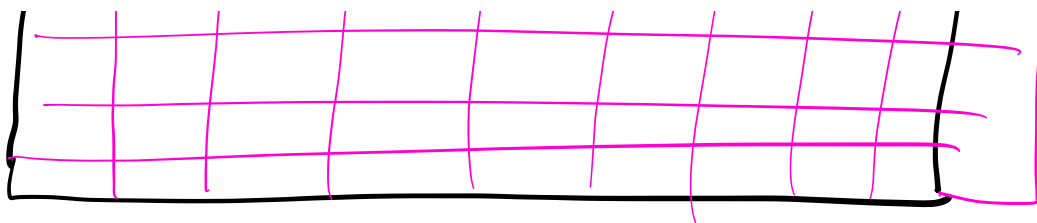
Amazon

- ① www.amazon.in \Rightarrow Availability
- ②  \Rightarrow suggestions fast / optimal
- ③ Checkout \Rightarrow concurrency



Observation





500 matches

2) Germany (4/5th standard)

Gauss

$$S: 1 + 2 + 3 + 4 + \dots + 97 + 98 + 99 + 100$$

Diagram illustrating the pairing of terms in the sum S . Brackets connect the first term (1) to the last term (100), the second term (2) to the second-to-last term (99), and so on, up to the 50th term (50) to the 51st term (50). Each pair is labeled with 101. A large bracket under the entire sequence is also labeled 101.

$$\begin{array}{rcl} S: & (1) + (2) + (3) + 4 + \dots + 97 + 98 + 99 + 100 \\ S: & (100) + (99) + (98) + \dots + 4 + 3 + 2 + 1 \end{array}$$

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

Diagram illustrating the sum $2S$. A large bracket under the sequence of 101s is labeled "100 terms".

$$2S = 100 \times (101)$$

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

$$\text{Sum of first } N \text{ natural no.} = \frac{(n)(n+1)}{2}$$

Factors

x is a factor of N ?

10 : 1, 2, 5, 10

$$N \% x = 0$$

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

Code

int countFactors (N) {

[1, N]

int count = 0;

for ($i = 1$; $i \leq N$; $i++$) {

Iteration \downarrow if ($N \% i == 0$) {

count++;

}
return count;

}

$$10^9 = 10 \times (10^8)$$

Assumption : 1 sec = 10^8 iteration

$$\begin{aligned} N = 10^9 &\Rightarrow 10^9 \text{ iterations} \Rightarrow 10 \text{ seconds} \\ N = 10^{18} &\Rightarrow 10^{18} \text{ iterations} \Rightarrow \underbrace{10^{10} \text{ seconds}}_{\frac{317 \text{ years}}{2}} \end{aligned}$$

$$1 \text{ sec} = 10^8 \text{ iterations}$$

$$1 \text{ iteration} = \underbrace{1 \text{ sec}}_{\text{arc}}$$

$$10^{18} \text{ iter.} = \frac{10^{18}}{10^9} \times \left(\frac{1}{10^9} \text{ sec} \right)$$

$$10^9 = \frac{10^9}{10^8} \text{ or } \underline{\underline{10^8}}$$

3 numbers

Given $\begin{cases} \underline{i}, \underline{j}, \underline{N} \Rightarrow \text{Integers} \\ \underline{i} \times \underline{j} = \underline{N} \Rightarrow \text{Both } \underline{i} \text{ \& \& } \underline{j} \text{ are factors} \\ \underline{j} = \underline{N/i} \end{cases}$

If \underline{i} is a factor of N ,
 N/i is also a factor.

$N = 24$

i	N/i	Count
1	24	+2
2	12	+2
3	8	+2
4	6	+2
6	4	??
8	3	??
12	2	
24	1	

$N = 100$

i	N/i	Count
1	100	+2
2	50	+2
4	25	+2
5	20	+2
⇒ 10	10	+2 + 1
20	5	-
25	4	
50	2	
100	1	

$i (i = N/i)$

$$i = N/i$$

1 to

$$i \leq N/i$$

$$i^2 \leq N$$

$$i \leq \sqrt{N}$$

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

$$N = 24$$

$$\text{int } x = 24;$$

$$\text{int } (y) = \text{sqrt}(x);$$

$$N = 24$$

$$[1, 4]$$

print(y);

$$\sqrt{24} \approx \boxed{4.8} = \underline{\underline{4}}$$

Count factors (N) d

count = 0;

sqrtN = \sqrt{N} ;

\Rightarrow for (i = 1; i $\leq \sqrt{N}$; i++) d

\Rightarrow if (N % i == 0) \Rightarrow ✓

if (i == N/i) d

count = count + 1; pair

}

else d

count = count + 2; pair

{

}

{

return c;

}

$$N = 10^{10} \Rightarrow \sqrt{10^{10}} = 10^5 \text{ iterations}$$

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

= 10 seconds

Given N , no. of times we need to divide it by 2 to reduce until it reaches 1

=

$$\log_2 N$$

$$\log_a a^m = m$$

$$\begin{array}{l} \text{int } x = 8 \\ \text{int } y = x/2 \Rightarrow \end{array} \begin{array}{ccc} 8 & 11 & 13 \\ 4 & 5 & 6 \end{array}$$

$$N: \quad 2^1 : 2 \rightarrow 1 = \log_2 2^1 = 1$$

$$2^2 : 4 \rightarrow 2 \rightarrow 1 \quad \log_2 2^2 = 2$$

$$2^3 : 8 \rightarrow 4 \rightarrow 2 \rightarrow 1 : \log_2 2^3 = 3$$

$$9 \xrightarrow{1/2} \underline{4} \xrightarrow{1/2} \underline{2} \xrightarrow{1/2} \underline{1} : \log_2 9 : \underline{3} \text{ (1...)} \quad \text{---}$$

$$2^4 : 16 \rightarrow 8 \rightarrow 4 \rightarrow 2 \rightarrow 1 \quad \log_2 2^4 = \underline{4}$$

Q Given a perfect square N .

Find the sqr (N)

I/P

49

100

So

O/P

7

10

\Rightarrow Not a valid input.

$[1, 2, 3, 4, \dots, \sqrt{N}]$

$N = 36$

$i: 1, 2, 3, 4, 5, 6, 7$
 $\times \quad \times \quad \times \quad \times \quad \times \quad \checkmark \quad$

$$i^2 = i \times i = \underline{\underline{N}}$$

Pseudo Code

$\text{sqrt}(N)$ d

for ($i=1$; $i \leq N$; $i++$) d

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

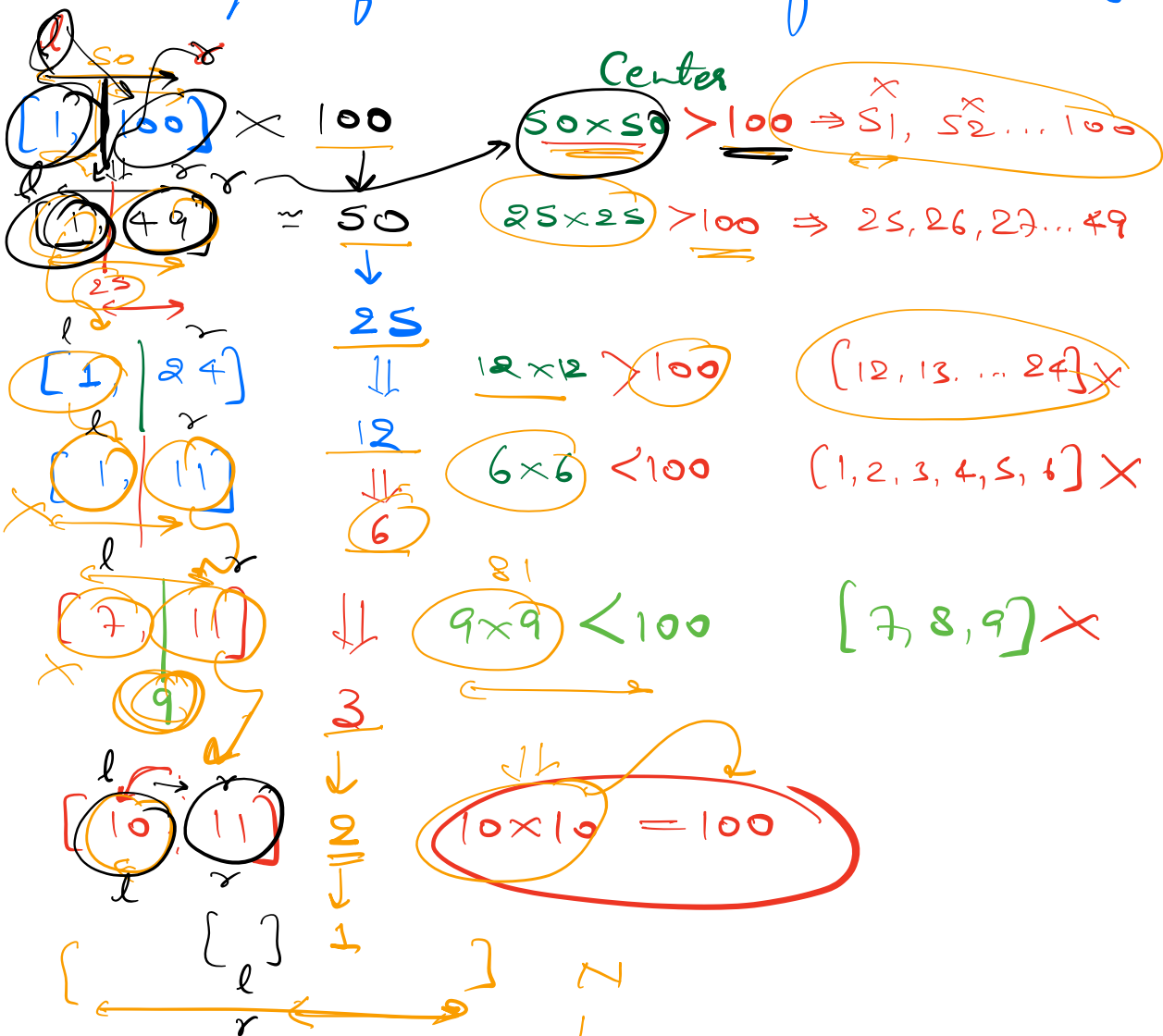
\Rightarrow if ($i \times i == N$) d \checkmark
return i ; \Rightarrow

$\{$
 $\}$

$N \Rightarrow \sqrt{N}$ iterations

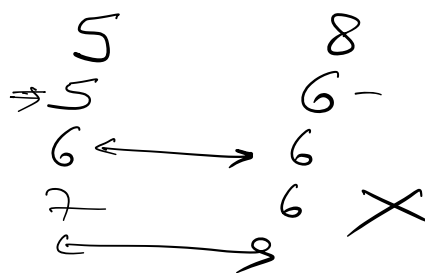
$$N = 100$$

sqrt of 100 will lie from [1 to 100]



$$\log_2 N$$

10 207



7 6
 (5) 2 < 3 1