

1 internship - MS
 Adobe - last 3 years
 ↓
 SDE 2
 Full stack — JS, React
 — Java, Spring boot
 slack / INA

1. PSP (Problem Solving Percentage) - Solved Assignment Problems / Total Open Assignment Problems

- There are two types of section - Assignment and Additional. Assignment section consists of implementation of the problems done in class. PSP is calculated based on only Assignment Problems.
- Additional Problems are slight modifications of assignment problem, they are not part of PSP but once you're done with assignment, we highly recommend to complete additional problems as well.
- Try to keep PSP least 85% no matter what. It shall really help you to stay focused and we have seen in the past that people with $\geq 85\%$, do well in Interviews.

2. Attendance

- Try to maintain at-least 75% attendance either through live classes or by watching recording.
- Though I will recommend you to come to classes regularly because otherwise it may create backlogs.
- So, I expect all of you to attend live classes and if for any reason you are unable to, then please send me a message stating the reason.

DSA → Intermediate
 → Advanced

- Introduction to Problem Solving
- Time Complexity
- Introduction to Arrays
- Prefix Sum
- Carry Forward
- Subarrays
- 2D Matrices
- Sorting Basics
- Hashing Basics
- Strings Basics
- Bit Manipulation Basics
- Interview Problems
- Contest [covers Full Intermediate DSA]

↓
 1.5 hrs → 3 Ques
 ≥ 2 Ques

① Lecture
 ↓
 9:05 - 11:30
 2.5 hrs

② Doubt

FAQs :

- Notes will be uploaded after the class.
- Assignments will be unlocked after the class ends.
- There is no deadline for assignments.
- If asking a question, ask in public chat.
- If answering a question, answer in private chat.

1. Count the Factors
2. Optimisation for counting the Factors
3. Check if a number is Prime
4. Sum of N Natural Numbers
5. Definition of AP & GP
6. How to find the number of a times a piece of code runs, i.e, number of Iterations.
7. How to compare two Algorithms.

what is a factor ?

i is a factor of N ?

if $N \% i == 0$

2 is a factor of 10

$10 \% 2 = 0$

$24 \% 2 = 0$

Factors of 24 cnt = 8

→ 1, 2, 3, 4, 6, 8, 12, 24

Factors of 10 cnt = 4

→ 1, 2, 5, 10

```

function countFactors (N) {
  int cnt = 0
  for (i = 1 till N {
    if (N % i == 0)
      cnt++
  }
  return cnt;
}

```

N
 \downarrow
 $1 \rightarrow N$
 N iterations

Online Platform

$1 \text{ GHz} \rightarrow 10^9 \text{ ops/sec}$
 $\rightarrow 10^8 \text{ iterations in } 1 \text{ sec}$

N	Iterations	Execution Time
10^8	10^8	1 sec
10^9	10^9	10 sec
10^{18}	10^{18}	$10^{10} \text{ s} \rightarrow 317 \text{ yrs}$

$$\begin{aligned}
 10^8 \text{ itr} &\rightarrow 1 \text{ sec} \\
 1 \text{ itr} &\rightarrow \frac{1}{10^8} \text{ sec} \\
 10^9 \text{ itr} &\rightarrow \frac{1}{10^8} \times 10^9 \text{ sec} \\
 &= 10 \text{ sec} \\
 10^{18} \text{ itr} &\rightarrow \frac{10^{18}}{10^8} \text{ s} \\
 &= 10^{10} \text{ s}
 \end{aligned}$$

Optimization

$$8 \times 3 = 24$$

$$5 \times 20 = 100$$

$i \times j = N$ (i and j are factors of N)

$\Rightarrow j = N/i$ (i and N/i are factors of N)

If i is a factor of N ,

then N/i is also a factor

$a \leq 5$
Max $a = 5$

$$i = 3$$

$$N = 24$$

$$N/i = 8$$

$$i = 4$$

$$N/i = 6$$

$$N = 24$$

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

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

$$i^2 \leq N$$

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

$$N = 100$$

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

i goes from $[1, \sqrt{N}]$

```

function countFactors(N) <
    int cnt = 0
    for i = 1 till sqrt(N) <
        if (N % i == 0) <
            if (i == N/i)
                cnt += 1
            else
                cnt += 2
    return cnt

```

$i + i \leq N$
 \uparrow
 $i = 1; i \leq \sqrt{N}; i++$
 $i \leq \sqrt{N}$
 \downarrow
 $i^2 \leq N$

7

cnt = 0 2 4 6 8 10

N = 24

i = 1	(1, 24)
i = 2	(2, 12)
i = 3	(3, 8)
i = 4	(4, 6)
i = 5	X

cnt = 0 2 4 6 8

N = 100

i = 1	(1, 100)	+2
2	(2, 50)	+2
3	X	
4	(4, 25)	+2
5	(5, 20)	+2
6	X	
7	X	
8	X	
9	X	+1
10	(10, 10)	+2

No

10 factors for 100?

9 factors

N \rightarrow \sqrt{N} iteration

N iterations Execution time
 10^{18} 10^9 10^5

10^8 iters \rightarrow 1 sec

317 years \rightarrow 10 s

Prime No. \rightarrow No. which has 2 factors, 1 and no. itself

10, 11, 23, 2, 25, 27, 31
 ↓ ↓ ↓ ↓ ↓ ↓ ↓
 1 1 1 1 1 1 31
 2 11 23 2 5 3
 5 25 9
 10 27

cnt = 4

is 1 Prime? Not prime,
 ↓ not composite
 1

Write a code to check Prime

```

fn checkPrime(N) <
  if (countFactors(N) == 2)
    return true
  else
    return false
  >
  
```

10:30

// Gauss

$$1 + 2 + 3 + 4 + 5 + 6 + \dots + 100 = ?$$

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

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

$$2S = \underline{101 + 101 + 101 + 101 + \dots + 101}$$

$$2S = 101 \times 100$$

$$\boxed{S = \frac{101 \times 100}{2}} = 5050$$

// Generalise \rightarrow sum of first N natural nos.

$$S = 1 + 2 + 3 + \dots + (N-1) + N$$

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

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

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

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

$$N=7 \quad 1 + 2 + 3 + 4 + 5 + 6 + 7$$

$$S = \frac{N(N+1)}{2} = \frac{7 \times 8}{2} = 28$$

Basic Math Properties

- 1) $[a \ b] \rightarrow a$ and b both included
- 2) $(a \ b) \rightarrow a$ and b not included

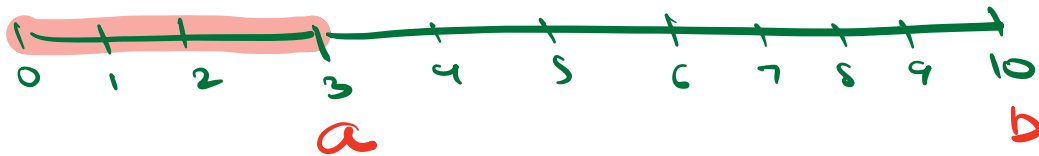
Nos. in the range $[3, 10]$



cnt = 8 3, 4, 5, 6, 7, 8, 9, 10

Nos. in range $[a, b] = b - a + 1$

$[3 \quad 10] \rightarrow \textcircled{8} \quad 10 - 3 + 1$



Iterations \rightarrow No. of times a loop runs

for ($i=1$; $i \leq N$; $i++$) < $i: 1 \text{ to } N$
 $[1 \ N]$

if ($i == N$)
break;

$N=5$

N iterations

$[a \ b] = b - a + 1$

$i=1$ ✓
 $i=2$ ✓
 $i=3$ ✓
 $i=4$ ✓
 $i=5$ ✓

loop breaks


```
for (i=0; i <= 100; i++) <
```

```
    S = S + i + i^2
```

$i \rightarrow [0 \quad 100]$

\downarrow
 $100 - 0 + 1$
 $= 101$ iterations

0
1
2
3
⋮
100

```
func() <
```

```
    for (i=1; i <= N; i++) <
```

```
        if (i%2 == 0)
            print(i)
```

$i \rightarrow [1 \quad N]$

$N - 1 + 1 =$
 N iterations

```
    for (j=1; j <= M; j++) <
```

```
        if (j%2 == 0)
            print(j)
```

$j \rightarrow [1 \quad M]$

$M - 1 + 1 =$
 M iterations

$(N + M)$ iterations

Geometric Progression (GP)

Every 2
nos.
have
common
ratio

$$\begin{array}{ccccccc} 5 & 10 & 20 & 40 & 80 \\ \hline & 10/5 & 20/10 & 40/20 & 80/40 \\ & = 2 & = 2 & = 2 & = 2 \end{array}$$

Generic notation -

Common
ratio
 \downarrow
 r

$$a \quad ar \quad ar^2 \quad ar^3$$

Sum of first n terms of GP

$$\frac{a(r^n - 1)}{r - 1}$$

$$r \neq 1$$

$a \rightarrow$ first term

$r \rightarrow$ common ratio

$n \rightarrow$ no. of terms

eg

$$\begin{array}{ccccccc} 5 & 10 & 20 & 40 & 80 \\ \hline & 10/5 & 20/10 \\ & = 2 \end{array}$$

$$n = 5$$

$$a = 5$$

$$r = 2$$

$$\begin{aligned} \frac{5(2^5 - 1)}{2 - 1} &= \frac{5 \times (32 - 1)}{1} \\ &= 5 \times 31 = 155 \end{aligned}$$



uP
 $x = 1/2$
 $a = 40$
 $n = 4$

Contest \rightarrow sort array

$[3, 2, 6, 8, 1] \rightarrow [1, 2, 3, 6, 8]$

① C++

② Java

③ Python

✓

Algo 1
 Chetan
 ↓
 15 sec
 (Windows XP)
 ↓
 Macbook Pro
 ↓
 7 sec
 ↓
 C++
 7 sec
 ↓
 Hot volcano
 ↓
 Mt Everest
 5 sec

Algo 2
 Isha
 ↓
 10 sec ✓
 (Macbook Pro)
 ↓
 Python
 ↓
 C++
 5 sec ✓

Conclusion

Can't evaluate algo performance using execution time \rightarrow depends on lot of factors like OS, lang of execution, place etc.

How can we compare 2 algo?

\downarrow
No. of iterations

① Revise using notes

WA

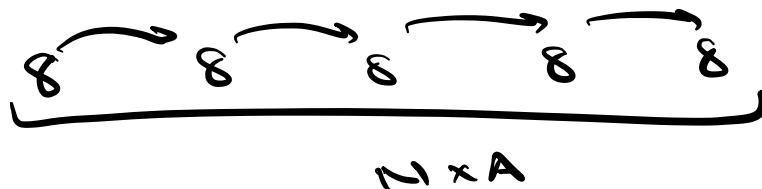
② Assignment

Slack

③ Additional

support @ scaler.com

$$x=1$$



$$5 \times 8 = 40$$

Aug - 23 - Intermediate - 2

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Doubts

$$1 \text{ GHz} \rightarrow 10^9 \text{ ops/sec}$$

$$\boxed{10 \text{ ops} \rightarrow 1 \text{ itr}}$$
$$1 \text{ opr} \rightarrow \frac{1}{10} \text{ itr}$$

$$10^9 \text{ opr} \rightarrow \frac{10^9}{10} = 10^8 \text{ itr}$$

(2)

$$N > 0 \quad 10 \quad 8$$

↓		↓
1	-1	±1
2	-2	±2
5	-5	±4
10	-10	

$$(N = -10) \rightarrow N = 10$$