Welcome

Intro. to problem solving:

Instructor:

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- class time 2.5 hours ± 10 min

- notes.

.pdf

Bookmarks & Notes

📎 1
Lecture Notes

← (red arrow)
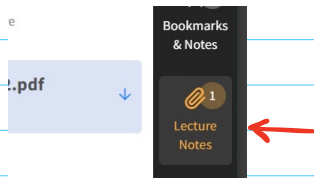
- Assignments & homework

- Peer Learning, class communications:

whatsapp group . https://chat.whatsapp.com/IBt9FwPqNsk6Ne7GrlYBut
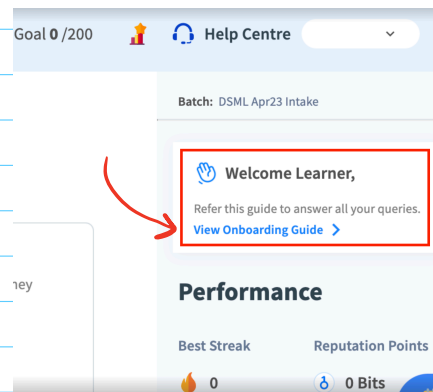
Corrected ↓

Quick questions: public chat
Answers : private chat
Questions (Pin your questions to be anwered at the end of session)

❓ Questions

✕

Pinned questioned →
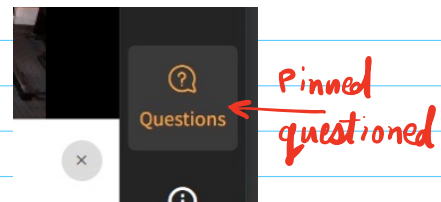
- Check the onboarding guide on your dashboard

Goal 0/200   🎧 Help Centre   ▾

Batch: DSML Apr23 Intake

🖐 Welcome Learner,
Refer this guide to answer all your queries.
View Onboarding Guide ›

Performance

Best Streak   Reputation Points
🔥 0   🎯 0 Bits

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topics:
1 - Intro ✓
2 Count of factors ✓
  - optimization ✓
3 Isprime? ✓
4 Sum of 1...n ✓
5 sqrt - perfect sqr. ✓
    - any number
6 log basics. ✓

7 - Topics int. DSA

int

P1 Count of factors: Given $\overset{a}{\vee}$ positive integer N, return count of

factors of N.

$N > 0$

what
is
factor

ex $N=6$ | 6 2 3 1 ans = 4
          $\times$ $\times$ $\times$ $\times$

$6/4 = 1.5$

$a/b = c$ → is a factor of a
          if c is whole int.

$a \% b = 0$

□ Quiz 10 | 10 **2** 5 **1** ans = 4
Correct ↵

Quiz 24 | 1 2 3 4 6 8 12 24 ans = 8

Psudo codes

```
int countFactor(int n){
    Count = 0
    for(i=1; i<=n; i++){
        if(n%i == 0) Count += 1
    }
    ret Count
}
```

n times

Quiz

*Can a realy fast processor compensate for inefficient algorithm?

1 GHz

N	runtime
10^8	1 sec
2×10^8	2 sec $= 2 \times 10^8 / 10^8$
10^7	0.1 sec $= 10^7/10^8$
⋮ n	$n / 10^8$ sec
Quiz 10^{18}	$10^{18}/10^8 = 10^{10}$ sec

$\dfrac{10^8}{2} \longrightarrow 0.5$

$\cancel{10^7}$ $\quad \dfrac{10^8}{2} = \dfrac{10 \times 10^7}{2}$

$= 5 \times 10^7$ years

317 years (green, underlined)

$\dfrac{24}{1} = \boxed{24}$ $24 \ \substack{\circlearrowleft} = \boxed{4}$ $\downarrow\downarrow$ $4 \times 6 = 24$

optimization?   n   n/i

$\dfrac{n}{2}$

$\sqrt{n}$

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

24 (1...4)
$\dfrac{24}{2} = 12$
1 → 12
24 $\dfrac{n}{2} = \dfrac{24}{2} = 12$

16	16/i
1	16
2	8
4	4
4	4
8	2
16	1

50	50/i
1	50
2	25
5	10
10	5
25	2
50	1

25	25/i
1	25
5	5
5	5
25	1

$$ i \leq \frac{n}{i} \Rightarrow i * i \leq n \Rightarrow i^2 \leq n \Rightarrow i \leq \sqrt{n} $$

$1, 2, \ldots, i$

36	36/i
i ⎧ 1	36
⎪ 2	18
⎨ 3	12
⎪ 4	9
⎩ 6	6
6	6
9	4
12	3
18	2
36	1

$1 \ldots \sqrt{36}$

```
int countFactor2(int n){
    count=0   int i;            → int_part
    for(i=1; i<=√n; i++){
        if(n%i==0) count+=2
    }
    if((i-1)*(i-1)==n) count-=1
    ret count
}
```

$\sqrt{24} = 4. \cdots$

i	24
+1	+24
+2	+12
+3	+8
+4	+6
+5	16

$10^8 \longrightarrow 1sec$

N	$\sqrt{N}$	runtime
10^8	10^4	$10^4/10^8 = 10^{-4}$ sec
10^{16}	10^8	$10^8/10^8 = 1$ sec
$\vdots$	$\vdots$	
10^{18}	10^9	$10^9/10^8 = 10$ sec

i	9/i
+1	+1
2	✗
+3	+3
4	

9

i=4   Count=4

P2 <u>check</u> if a number is prime.
↳ what is prime?

positve integer **N**.

a number > 1 that is divisable
only by 1 & itself.

```
bool isPrime(int n){
    if (countfactor2(n) ==2){
        ret true;
    }
    ret false;
}
```

ret (countfactor2 ==2)

5 → 1, 5

13 → 1 13

12 → 1 , 12, 2, 6, 3, 4

2 → 1 2

10 | 2 10
     5 1

iteration √n

(lag n / 2) → advanced DSA

P3 Sum of n natural numbers

ex $n = 10$ $\underline{S = 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10} = \boxed{55}$

$S = 10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1$

$2S = 11 + 11 + 11 + \cdots + \cdots \qquad + 11 = 10 \times 11$

$2S = 10 \times 11 \Rightarrow S = \dfrac{10 \times 11}{2} = 55$

n

$S = 1 + 2 + 3 + \cdots + n$

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

$2S = (n+1) + (n+1) + (n+1) \cdots + (n+1) = n \times (n+1)$

$2S = n \times (n+1) \Rightarrow \boxed{S = \dfrac{n \times (n+1)}{2}}$

$16 = 4 \times 4 \qquad \sqrt{16} = 4$

?

P4.1 Given N (N is a perfect squre) return sqr.root(N).

```
int sqrt1(int n){
    for(i=1; i<=n; i++){
        if(i*i==n) ret i
    }
    ret -1
}
```

iterations

$n \longrightarrow \sqrt{n}$

i	i×i	n
1	1 \	16
2	4 \	16
3	9 \	16
4	16 == 16 ✓	

P4.2 Given N (any positive int) return floor(sqr.root(N))

$\lfloor 3.2 \rfloor = 3 \quad \lfloor \sqrt{24} \rfloor = 4$

↳ ✓ what is floor

$\lfloor 4 \rfloor = 4 \qquad 16 < 24 < 25$

$\downarrow \qquad \downarrow$

4, 4,...,5

50

n=50

i	i*i	>=
1	1	< ✗
2	4	< ✗
3	9	< ✗
4	16	< ✗
5	25	< ✗
6	36	< ✗
7	49	< ✗
8	64	> ✗

```
int sqrt2(n){
    i=1; ans=0
    while(i*i<=n){
        ans=i
        i++
    }
    ret ans
}
```

Log Basics

$$a \leftarrow 2^{3 \to b} = 8 \searrow c \qquad a^b = c \qquad \sqrt[b]{c} = a$$

$$a \leftarrow 3^{2 \leftarrow b} = 9 \searrow c \qquad 2^3 = 8 \longleftrightarrow \sqrt[3]{8} = 2$$

$$2^6 = 64 \qquad\qquad\qquad \log_2 8 = 3$$

$$10^3 = 1000 \qquad \log_{10} 1000 = 3 \qquad a \quad a^{10} \qquad \boxed{\log_a a^{10} = 10}$$

HW — Consider n (a positive int) how many times can we divide

n by 2 till it reaches 1.

ex $\quad 100 \xrightarrow{/2} 50 \xrightarrow{/2} 25 \xrightarrow{/2} 12 \xrightarrow{/2} 6 \xrightarrow{/2} 3 \xrightarrow{/2} 1$

ans = 6 $\qquad\qquad\qquad\qquad$ (n)

intermidiate content

Prob solve. 1

- time Complixity 2
- Array 6 + 2 = 8
- Bit manipulatin 2
- math - arethmatic 1
- Sorting 1
- string 1
- Hashing **2**
- recursion 2
- Classes & Object ←
- Lists(linked List) 1
- Tree Basics 1

HW Assignment ⎰ - hints
⎱ - Peer
⎱ - TA
⎱ - Instructor