Grind 2 Notes

29 April 2025 17:15

B. Multiply by 2, divide by 6

time limit per test: 1 second
memory limit per test: 256 megabytes

You are given an integer n. In one move, you can either multiply n by two or divide n by 6 (if it is divisible by 6 without the remainder).

Your task is to find the minimum number of moves needed to obtain 1 from n or determine if it's impossible to do that.

You have to answer t independent test cases.

Input

The first line of the input contains one integer t ($1 \le t \le 2 \cdot 10^4$) — the number of test cases. Then t test cases follow.

The only line of the test case contains one integer n ($1 \le n \le 10^9$).

Output

For each test case, print the answer — the minimum number of moves needed to obtain 1 from n if it's possible to do that or -1 if it's impossible to obtain 1 from n.

Example

input

```
7
1
2
3
12
12345
15116544
387420489
```

output

```
0
-1
2
-1
-1
12
36
```

n/6 ✓

n → ×2
n → /6

n → 1
→ ×2 → 1 ✓
→ /6 → 1 ✓
X → -1

pf → 1

x%3≠0 , 6 → can't be divisible ✓ −1 → 1

x%3 ≠0 , −1 → ×2 or /6

n = 10 → 1 x → 10/6 or 10×2 → 20 → 2×5×2×3

* x%3 == 0 ✓

x%2 ≠ 0 → x×2 ⇒ 2x → 2×3 ✓ 2×3 = 6

x/6

* x%3 == 0 and x%2 == 0 ✓

x/6 , cnt++ → 1 → print (cnt)

D)

D. Road To Zero

time limit per test: 1 second
memory limit per test: 256 megabytes

You are given two integers x and y. You can perform two types of operations:

1. Pay a dollars and increase or decrease any of these integers by 1. For example, if $x = 0$ and $y = 7$ there are four possible outcomes after this operation:
   - $x = 0, y = 6$;
   - $x = 0, y = 8$;
   - $x = -1, y = 7$;
   - $x = 1, y = 7$.
2. Pay b dollars and increase or decrease both integers by 1. For example, if $x = 0$ and $y = 7$ there are two possible outcomes after this operation:
   - $x = -1, y = 6$;
   - $x = 1, y = 8$.

Your goal is to make both given integers equal zero simultaneously, i.e. $x = y = 0$. There are no other requirements. In particular, it is possible to move from $x = 1, y = 0$ to $x = y = 0$.

Calculate the minimum amount of dollars you have to spend on it.

Input

The first line contains one integer t ($1 \le t \le 100$) — the number of testcases.

The first line of each test case contains two integers x and y ($0 \le x, y \le 10^9$).

The second line of each test case contains two integers a and b ($1 \le a, b \le 10^9$).

Output

For each test case print one integer — the minimum amount of dollars you have to spend.

x, y → [0,0]

+ −

10 ✓
↓
00 ✓

Example

input

```
2
1 3
391 555
0 0
9 4
```

output

```
1337
0
```

Note

In the first test case you can perform the following sequence of operations: first, second, first. This way you spend $391 + 555 + 391 = 1337$ dollars.

In the second test case both integers are equal to zero initially, so you dont' have to spend money.

* $x, y \longrightarrow (0,0)$

a) $5,4 \rightarrow 4,4$ or $5,3$ or $6,4$ or $5,5$ ~~Comp~~

cost b) $5,4 \rightarrow 6,5$ or $4,3 \rightarrow$ 1 operation

$+, + \rightarrow$ $+ \rightarrow +1$, $x \rightarrow x+1 \rightarrow (0,0) \rightarrow$ operation

$- -$ → get to zero, so only decrease ✓

1 3 } $(x,y) \rightarrow 0$

391 555 } cost

$x, y \rightarrow 0, 0$ }

1 3

↓

(0, 0)

1 1 } operation one

(0, 0) → b

0 , 2 } one operation

y

(0,0) → at once

(0, 0) → a

* Greedily → a or b

a → (0,0)

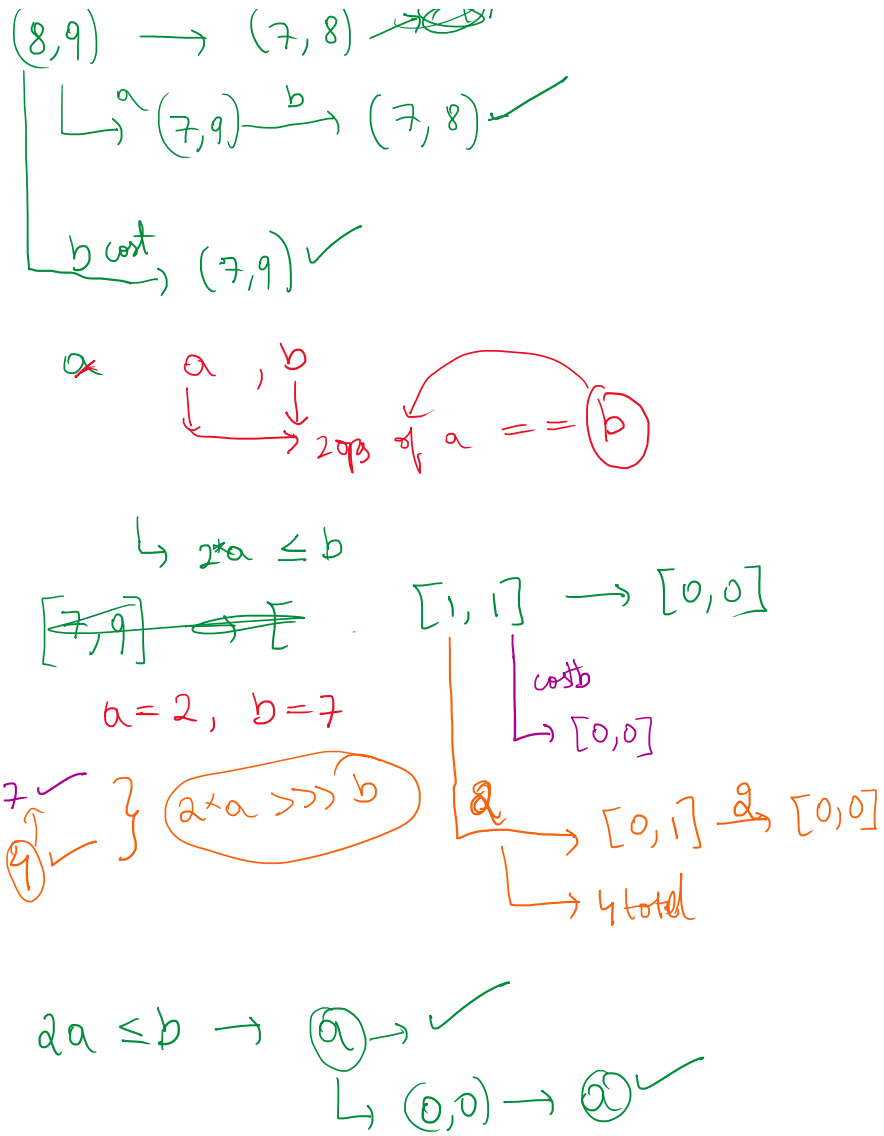
b → (0, x) }

(β, 0)

(0,0)

$(x,y) \rightarrow (x-1, y-1) \rightarrow$ 2 operation

$(8,9) \rightarrow (7,8)$



E. Ichihime and Triangle

time limit per test: 1 second
memory limit per test: 256 megabytes

Ichihime is the current priestess of the Mahjong Soul Temple. She claims to be human, despite her cat ears.

These days the temple is holding a math contest. Usually, Ichihime lacks interest in these things, but this time the prize for the winner is her favorite — cookies. Ichihime decides to attend the contest. Now she is solving the following problem.

You are given four positive integers a, b, c, d, such that $a \le b \le c \le d$.

Your task is to find three integers x, y, z, satisfying the following conditions:

- $a \le x \le b$.
- $b \le y \le c$.
- $c \le z \le d$.
- There exists a triangle with a positive non-zero area and the lengths of its three sides are x, y, and z.

Ichihime desires to get the cookie, but the problem seems too hard for her. Can you help her?

Input

The first line contains a single integer t ($1 \le t \le 1000$) — the number of test cases.

The next t lines describe test cases. Each test case is given as four space-separated integers a, b, c, d ($1 \le a \le b \le c \le d \le 10^9$).

Output

For each test case, print three integers x, y, z — the integers you found satisfying the conditions given in the statement.

It is guaranteed that the answer always exists. If there are multiple answers, print any.

a,b,c,d → input
a ≤ b ≤ c ≤ d
↓
x,y,z

condition

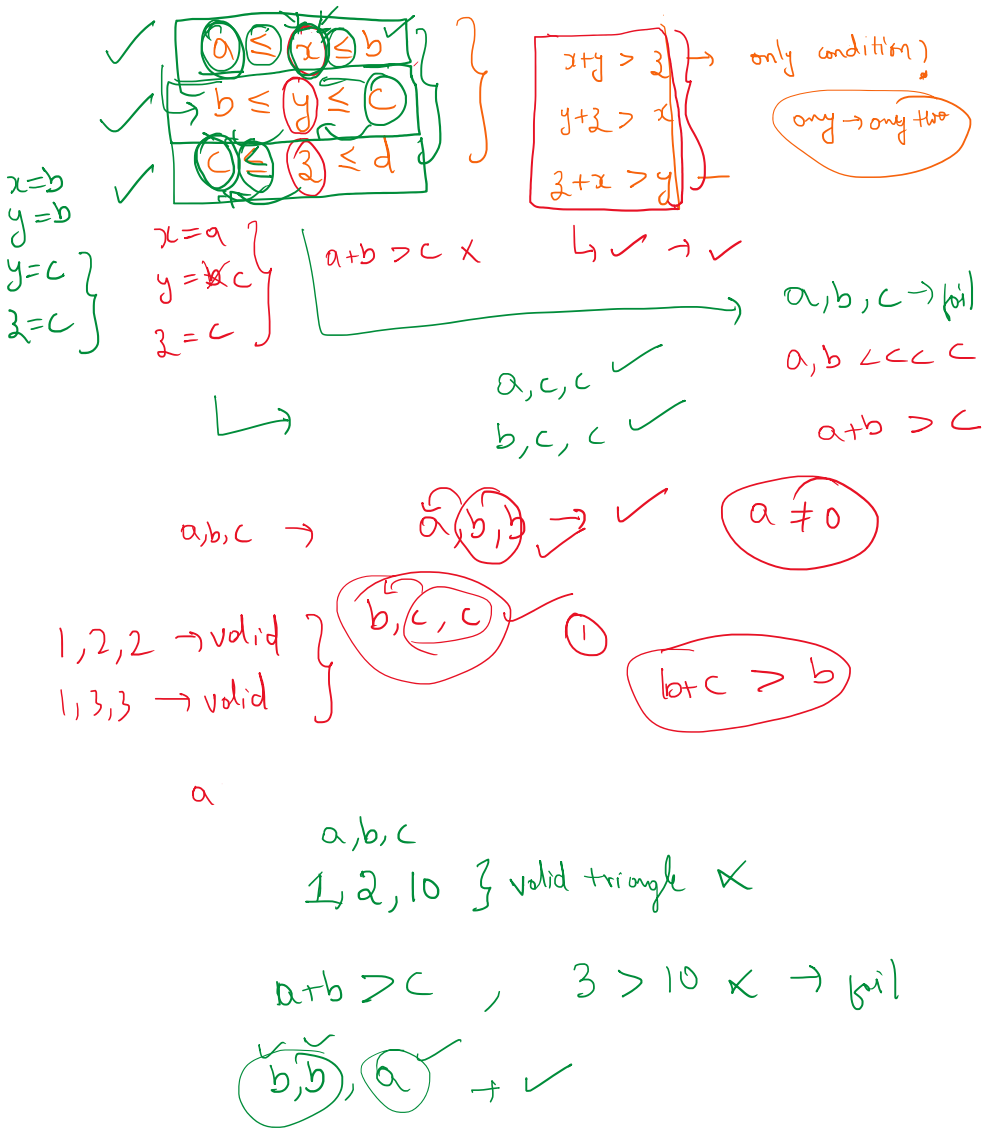
Example

input Copy

```
4
1 3 5 7
1 5 5 7
100000 200000 300000 400000
1 1 977539810 977539810
```

output Copy

```
3 4 5
5 5 5
182690 214748 300999
1 977539810 977539810
```



A. Little Artem

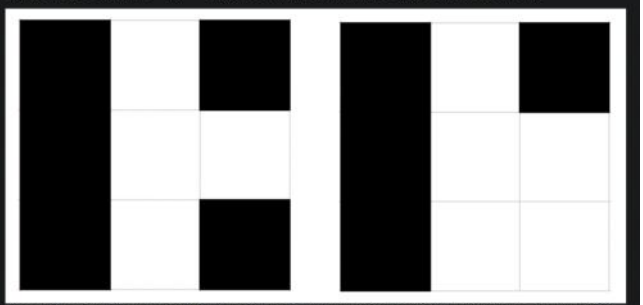
time limit per test: 1 second
memory limit per test: 256 megabytes

Young boy Artem tries to paint a picture, and he asks his mother Medina to help him. Medina is very busy, that's why she asked for your help.

Artem wants to paint an $n \times m$ board. Each cell of the board should be colored in white or black.

Lets B be the number of black cells that have at least one white neighbor adjacent by the side. Let W be the number of white cells that have at least one black neighbor adjacent by the side. A coloring is called **good** if $B = W + 1$.

The first coloring shown below has $B = 5$ and $W = 4$ (all cells have at least one neighbor with the opposite color). However, the second coloring is not **good** as it has $B = 4, W = 4$ (only the bottom right cell doesn't have a neighbor with the opposite color).



Please, help Medina to find any **good** coloring. It's guaranteed that under given constraints the solution always exists. If there are several solutions, output any of them.

m x n → input
↓
Solve ✗

Input
Each test contains multiple test cases.

The first line contains the number of test cases t ($1 \le t \le 20$). Each of the next t lines contains two integers n, m ($2 \le n, m \le 100$) — the number of rows and the number of columns in the grid.

Output
For each test case print n lines, each of length m, where i-th line is the i-th row of your colored matrix (cell labeled with 'B' means that the cell is black, and 'W' means white). Do not use quotes.

It's guaranteed that under given constraints the solution always exists.

Example

input Copy

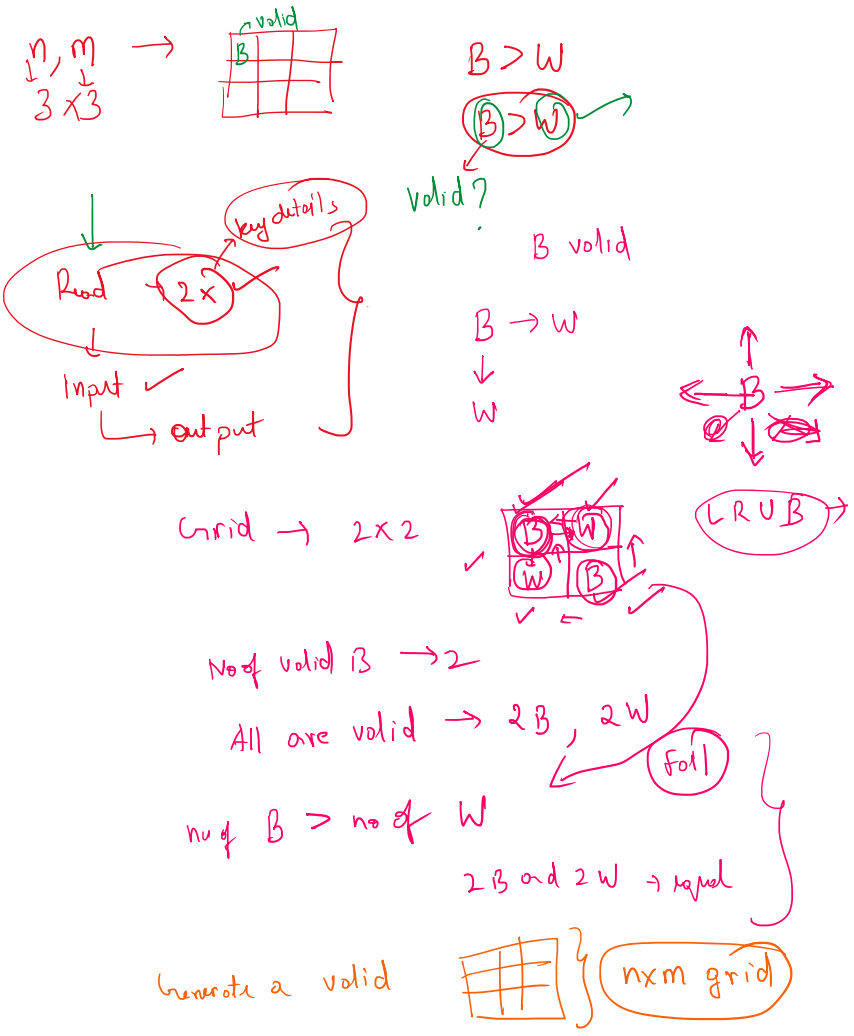
```
2
3 2
3 3
```

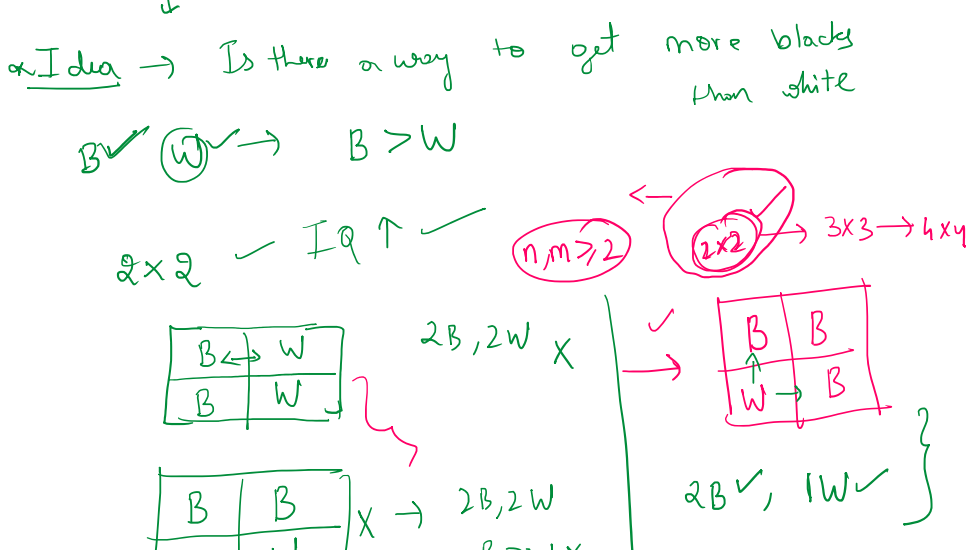
output Copy

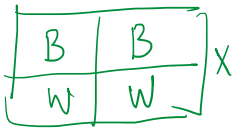
```
BW
WB
BB
BWB
WBW
BWB
```

Note
In the first testcase, $B = 3, W = 2$.

In the second testcase, $B = 5, W = 4$. You can see the coloring in the statement.



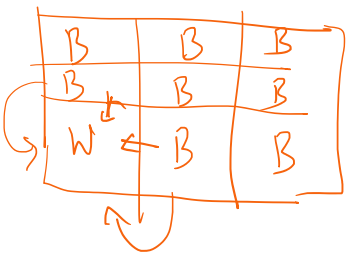




→ 2B, 2W
B > W ✗

2B ✓, 1W ✓

3×3

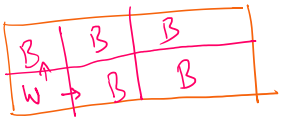


2B, 1W

2B, 1W
+
xB, yW ✗
B > W
2 > 1 ✓

3×3 , 2×3

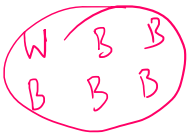
2B, 1W ✓



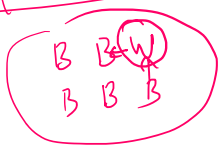
↳

B ✗
W ✗

2B > W



or



2×2 → All → one valid → check of others ✓

1×2 ✗ n, m ≥ 2

3×2 → ~~3×3~~
↳ 2×3 ✓

W

C)

C. Worms

time limit per test: 1 second
memory limit per test: 256 megabytes

10^5 operation

It is lunch time for Mole. His friend, Marmot, prepared him a nice game for lunch.

Marmot brought Mole n ordered piles of worms such that i-th pile contains a_i worms. He labeled all these worms with consecutive integers: worms in first pile are labeled with numbers 1 to a_1, worms in second pile are labeled with numbers $a_1 + 1$ to $a_1 + a_2$ and so on. See the example for a better understanding.

Mole can't eat all the worms (Marmot brought a lot) and, as we all know, Mole is blind, so Marmot tells him the labels of the best juicy worms. Marmot will only give Mole a worm if Mole says correctly in which pile this worm is contained.

Poor Mole asks for your help. For all juicy worms said by Marmot, tell Mole the correct answers.

worm no → piles

Input

The first line contains a single integer n ($1 \le n \le 10^5$), the number of piles.

The second line contains n integers $a_1, a_2, \ldots, a_n$ ($1 \le a_i \le 10^3$, $a_1 + a_2 + \ldots + a_n \le 10^6$), where a_i is the number of worms in the i-th pile.

The third line contains single integer m ($1 \le m \le 10^5$), the number of juicy worms said by Marmot.

The fourth line contains m integers $q_1, q_2, \ldots, q_m$ ($1 \le q_1 \le a_1 + a_2 + \ldots + a_n$), the labels of the juicy worms.

Output

Print m lines to the standard output. The i-th line should contain an integer, representing the number of the pile where the worm labeled with the number q_i is.

Examples

input

```
5
2 7 3 4 9
3
1 25 11
```

output

```
1
5
3
```

Note

For the sample input:

- The worms with labels from [1, 2] are in the first pile.
- The worms with labels from [3, 9] are in the second pile.

n, m →
array of piles

n → ordered piles

i th index → x ✓ (a_i)

1 to a_1, a_{1+1} to a_2,

5 → length

Note
For the sample input:

- The worms with labels from [1, 2] are in the first pile.
- The worms with labels from [3, 9] are in the second pile.
- The worms with labels from [10, 12] are in the third pile.
- The worms with labels from [13, 16] are in the fourth pile.
- The worms with labels from [17, 25] are in the fifth pile.

5 → length

[2, 7, 3, 4, 9] → array

3 → next array of input about worms

1 25 11

2 worms

[2, 7, 3, 4, 9]

[1 to 2, 3 to 9, 10 to 12, 13 to 16, 17 to 25] → worms position

1 2 3 4 5

3 → third

observe

start pos of 1 → end pos of some pile

↓

started (end pos + 1)

↓

write

[1-2, 3-5]

↓ prefix sum

original Array

[2, 7, 3, 4, 9]

[2, 9, 12, 16, 25]

[2, 7, 3, 4, 9]

[2, 9, 12, 16, 25]

[2, 3, 10, 13, 17]

1)

till 2 till 9

3,9 13,16

[2, 9, 12, 16, 25] → not

worm - no

10, 12

15th 12 13-16

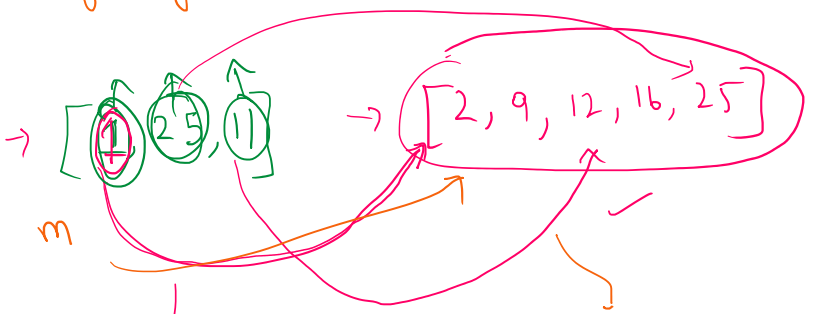
[2, 9, 12, 16, 25] → easily find out

2) once prefix sum is done

↓

the worm position (pile)

finding the worm position (pile)



possible and correct

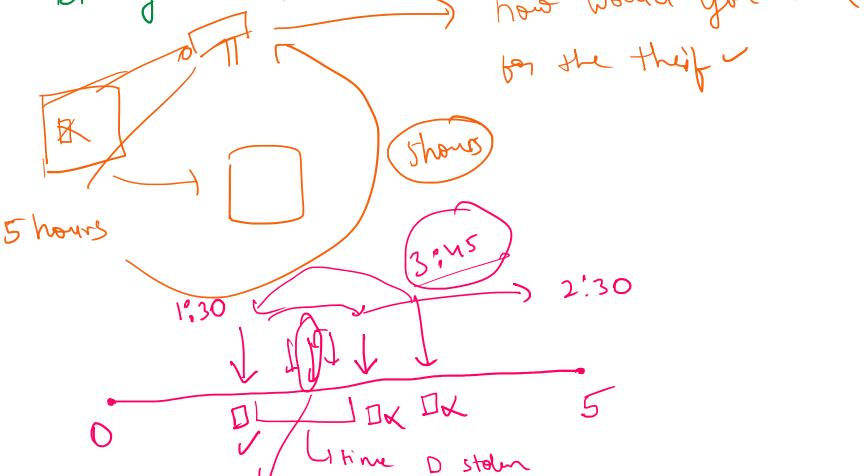
TLE → Time limit exceeded

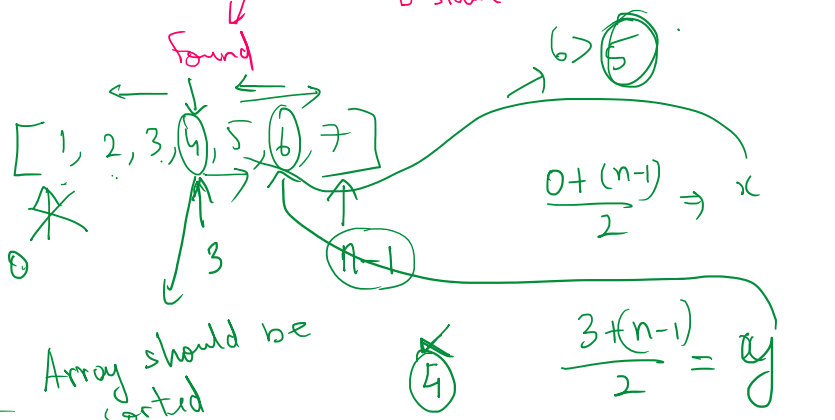
TLE: O(m x n)

O(10^5 x 10^5)
↳ O(10^10)

* Question
↓
prefix / BS

Binary Search



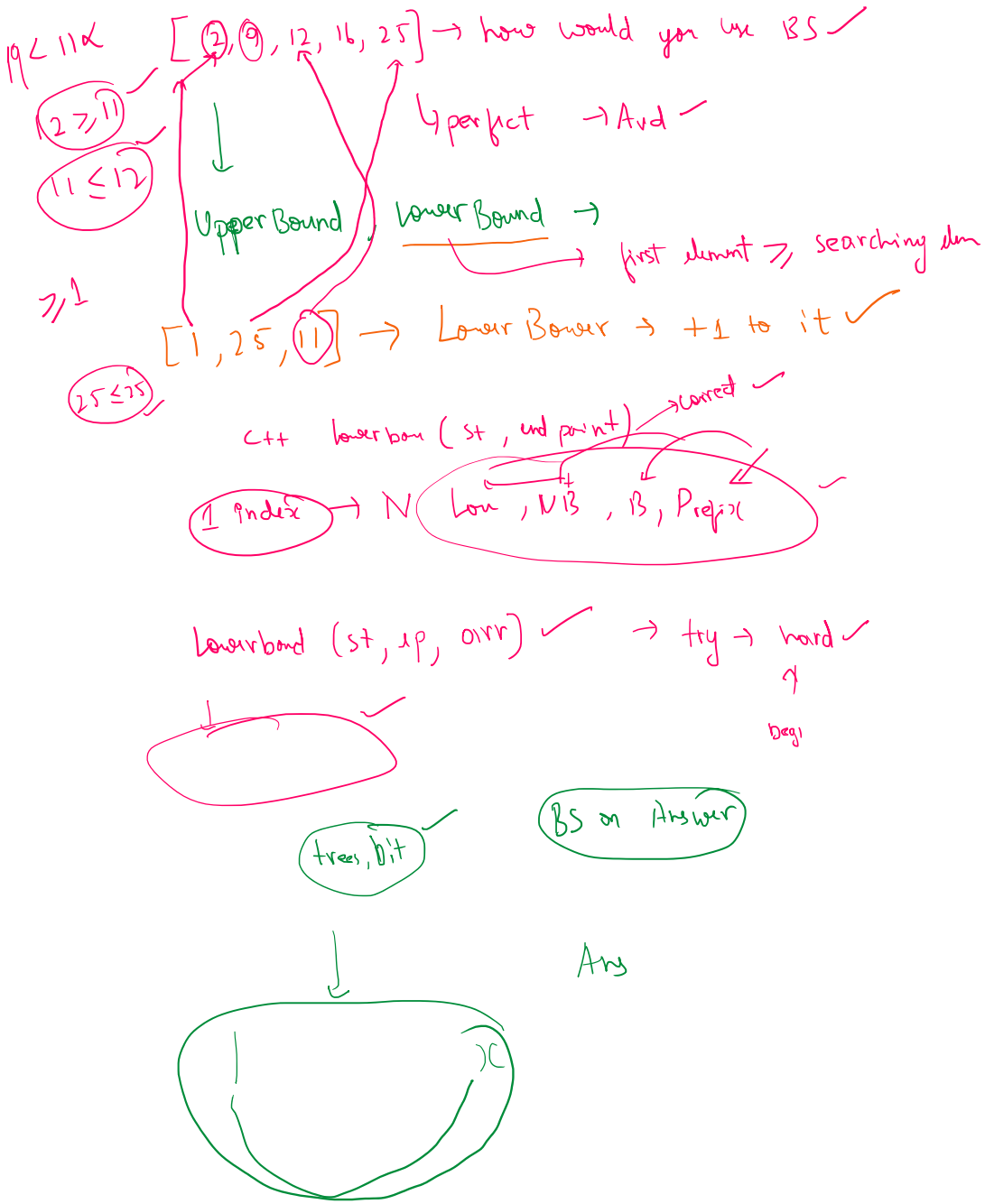


Array should be sorted

Prep:

BS → 1200 / pupil → tech ✓ → cp

widely in interviews ✓ → Intern


[2, 9, 12, 16, 25] → how would you use BS
Upper Bound
Lower Bound →
first element ≥ searching elem
[1, 25, 11] → Lower Bound → +1 to it
C++ lowerbound (st, end point)
1 index → NO
Low, MB, B, Prefix
lowerbound (st, ip, arr) → try → hard
tree, bit
BS on Answer
Any