DIU Take-Off Programming Contest

Fall 2021

[Main Round]

Organized By

Problem set

Platform Support

Toph

Judging Panel

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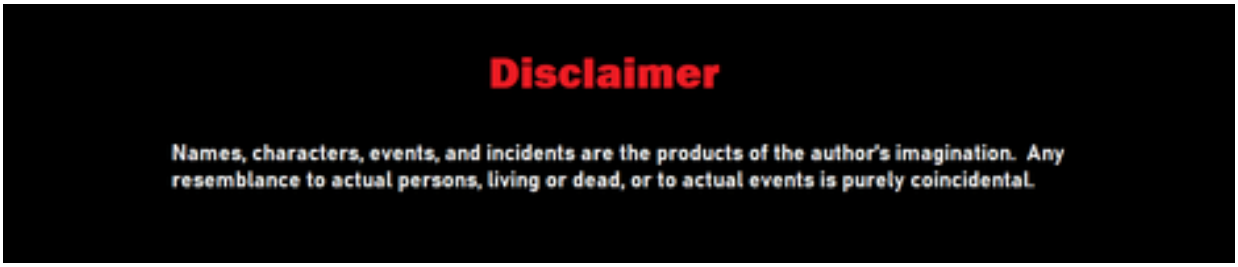
A. Greatest of All Time

Time Limit: 1s **Memory Limit:** 512 MB

Description:

Welcome to the squid game of programming. Where I won't be killing you rather kill the most precious thing for you in the contest, TIME. You might be wondering how am I going to do that? With a hella lengthy statement, duh!



Let's start with once upon a time…

There was a very ordinary guy who shall not be named. He claims he never won anything but then he got introduced to programming. He liked it, he loved it, he owned it. Since then he practiced hard day and night, 10 to 12 hours per day on average. He conquered every zone he stepped into and made that his forte. But only winning doesn't make anyone's life easier. There will be Kang Sae-byeok to steal, Cho Sang-Woo to betray, Han Mi-nyeo to pose as someone bigger than they actually are, Oh Il-nam to make the move from behind and laugh seeing someone getting framed, Jang Deok-su who will think they can do anything if they want just because they have the power to, but above all there will be Abdul Ali who will support anyone against all odds. The life of the protagonist of this statement wasn't any different. All of this made him a champion like Seong Gi-Hun, the greatest of all time.

Finally, the story leads to today's contest. Yes, the greatest of all time was born today, just like you are going to be born as a competitive programmer officially through this contest and rise up to the sky to be one of our shining stars. I can't guarantee you a smooth path along the way.

But all I can say is Best of Luck and "Practice always makes it better." So begin your journey by printing "Fate is like a game where winning depends on your performance." because that is what today your fate is depending on. Or you can just copypaste the code below but remember copypasting is not a good thing, I'm allowing you to copy from the statement to compensate for wasting so much of your time with a statement like this-

```
#include <stdio.h>

int main() {

    printf("Fate is like a game where winning depends on your performance.\n");

    return 0;

}
```

Input

No input

Output

Output one line "Fate is like a game where winning depends on your performance." (without quotes)

Notes: Be careful about the newline('\n') at the end.

Problem Category: Giveaway
Problem Setter: Riadh Hasan
Reviewer: Tanima Hossain
Special Thanks: Ahmed Abdullah Shourav

B. Easy Squid

Time Limit: 1s **Memory Limit:** 512 MB

Description:

Welcome to the amazing game called Easy Squid. The famous Squid Game champ Demetris also has arrived to play this game. He wants to enjoy Easy Squid as long as gets satisfaction. The game has only one requirement that the player has to register first by paying 567 takas as a registration fee.

Demetris did not know about the registration. So, he quickly starts checking his pockets to make sure that he has enough money or not. After checking, He is counting money to ensure that he has **more than or equal to 567 takas** for getting in this game. But the problem is he is not good at calculation, so he ask for your help.

You are given one integer T that is the **amount of money** Demetris has. Now, Your task is to say that "**Demetris is eligible for this game!",** if he has **enough money** for registration, Otherwise say **"Better luck next time!"**

Input

The input contains one integer T that indicates the amount of money Demetris has.

$0 \leq T \leq 1000$.

Output

Print "**Demetris is eligible for this game!**" without quotation marks, if he has enough money for the registration fee, Otherwise print "**Better luck next time!**" (without quotation marks).

Sample Input	Sample Output
500	Better luck next time!
666	Demetris is eligible for this game!

Notes: Be careful about the newline('\n') at the end.

Problem Category: If-else
Problem Setter: MD. Alif Babu
Reviewer: Galib Hossain

C. Survival of RLGL

Time Limit: 1s **Memory Limit:** 512 MB

Description:

Ah! Those days! Used to play this game a lot. The Korean people named this game RLGL (RED LIGHT GREEN LIGHT). Those who don't know how to play this game, here is a brief description of the game.

One creepy headed girl robot named "cKt" looks at a tree or wall then closes its eyes and then shouts green light, red light for a certain amount of time. All the participants of this game stand behind a starting line and their target is to reach the finishing line, which is close to cKt. Time to time, cKt looks back to find movement in the participants after shouting Red light. If someone is detected with movement then cKt eliminate that participant. So everyone tries to reach the finishing line when cKt is not looking behind and shouting Green Light.

One day 110 participants were forced to play the RLGL game with cKt. One of them were "TiMan", the legendary RLGL player. Within the first 30 minutes all the players were dead except TiMan. Although he is alive, has not reached the finishing line yet. It was announced that cKt is now going to call RLGL one last time. If TiMan can not cross the finishing line which is at D **distance away from the starting line** within this call, he will be dead. Currently, **TiMan is X distance far from the starting line**. TiMan knows that cKt will take t time for the last RLGL call. So he starts running towards the finishing line with the acceleration a. Find out if TiMan can survive or not. If he could cross finish line then you have to print **"Allah bachaise!!!**" otherwise "**Moira gesi!!!**"(without Quote)

N.B. The formula for finishing the remaining distance is $s=\frac{1}{2}at^2$ where s is the distance, t is the time and a is the acceleration.

Input

The first line contains two integers **D and X** where **D** is the total distance from starting line to the finishing line and **X** is distance crossed by TiMan from the starting line. In the second line there are also two integers a and t where a is the acceleration of TiMan and t is time of calling RLGL.

$1 \leq X \leq D \leq 3*10^4$

$0 \leq a \leq 50$

$1 \leq t \leq 50$

Output

You have to print a line "**Allah bachaise!!!**"(Without Quote) if TiMan can cross the finish line otherwise "**Moira gesi!!!**"(without Quote).

Sample Input	Sample Output
50 40 3 2	Moira gesi!!!
52 30 5 3	Allah bachaise!!!

Notes: Be careful about the newline('\n') at the end.

Problem Category: if-else+math
Problem Setter: Farjana Akter
Reviewer: Mohammad Dipu Sultan

D. Watch Your Steps !!

Time Limit: 1s **Memory Limit:** 512 MB

Description:

Hi-Gun couldn't let his gganbu buddy Il-Nam die in the fourth game instead he sacrificed his own life 😢. So according to the game rules as Il-Nam survived he had to move to the fifth game which is "Glass stepping stone". In this game there's a bridge made out of N glass steps numbering as 1, 2, 3, 4……, N. Among these **steps some glass steps are durable, some are not.** If anyone steps on the non-durable glass steps he will immediately fall down and be eliminated. **At first he has crossed 0 glass steps.** A player can use only **3 hops** to cross all the steps. In the **1st hop,** he can cross X number of glass steps, in the **2nd hop** he can cross more Y number of glass steps than his current glass steps, and in the 3rd hop, he can cross more

Z number of glass steps (Remember no less no more). In order to survive, a player has to cross the bridge (**all the N glass steps**) only using these 3 hops and **if he couldn't cross all the glass steps even after the 3rd hop he will be eliminated immediately.**

As Il-Nam didn't have any plan of moving to this game he got trapped. But, he already got a secret message from his people. The message is, among those N glass steps Cp th glass steps are not durable where **P is 1, 2, 3** because there are only **3 non-durable** glass steps. Still, he is afraid of whether he would be able to cross all the glass steps safely or not, and if not then in which hop he will be eliminated. That's why he wants your help to find it out for him.

Input

The first and only line consists of 5 integers N,X,Y,Z,C separated by spaces, where Nis the number of glass steps, X, Y and Z are the count of glass steps Il-Nam can cross in his 1st, 2nd, and 3rd hop respectively and C is a constant for determining non-durable glass steps (see the statement).

$3 \leq N \leq 10^9$

$1 \leq (X+Y+Z) \leq (N+1)$

$2 \leq C \leq 1000$

Output

You have to output one line. Print "**Safe**" (without quotes) if Il-Nam can cross all the glass steps safely otherwise print **"Eliminated on 1st hop**" (without quotes) if he falls down on the **1st hop or "Eliminated on 2nd hop"** (without quotes) if he falls down on the **2nd hop or "Eliminated on 3rd hop"** (without quotes) if he falls down/die on the **3rd hope or he does not able to reach the (N+1)** 'th glass steps. Check out the samples for clarification.

Sample Input	Sample Output
20 3 5 10 2	Eliminated on 2nd hop
27 8 9 10 3	Eliminated on 3rd hop
20 5 10 6 2	Safe

in the 1st test case using 1st hop, he will reach 3rd glass step and after using 2nd hop he will reach 8th glass step but as we can see C^3 or 2^3 is equal to 8, So 8 is a non durable glass that's why he was eliminated on the 2nd hop.

Notes: Be careful about the newline('\n') at the end.

Problem Category: Harder if else
Problem Setter: Umme Rukaya Suny
Reviewer: Rana Hossain

E. Inception

Time Limit: 1s **Memory Limit:** 512 MB

Description:

"No, I'm not going to play the game.", said Ms. Maya.

"But you have a chance to change your life.", said The Mysterious Man.

"I still don't want to play.", said Ms. Maya, shrugging her shoulders.

"Just close your eyes and think about everything you ever desired. Now imagine getting all of it.", said The Mysterious Man in an alluring way.

"That sounds amazing. But no thanks. Leave me alone.", Ms. Maya said angrily.

"But why? Why do you keep refusing? How can you refuse this?"

"Well… You see, getting everything just like that is kinda boring. Feels like getting old too fast. But the real problem is I really hate Squids!!!", said Ms. Maya.

Hearing this, The Mysterious Man was baffled and was at a loss for words. After some time he said, "Well then…. Sorry for troubling you. You look tired. Here's a bottle of juice. Please take it as a token of my apology."

Ms. Maya was really tired. So she accepted it without any other words and drank the whole bottle empty. Seeing the man go away she sighed, went home, and straight to sleep. She thought that she got rid of the Squid Game thing. Little did she know that she was drugged and the Administrators of the Squid Game had other plans.

Thus began the Game of Dreams, the INCEPTION.

In this game, Ms. Maya is trapped in a dream world. In there, there are many doors. If Ms. Maya opens a door, she enters another dream world or exits a dream world she is already in.

All the doors have an integer number written on them. If Ms. Maya opens a door with integer X written on it then one of the following two incidents happen:

If she hasn't already exited dream X after entering it, she exits dream X. Otherwise, She enters dream X.

See samples and Notes for more clarification.

Remember, Ms. Maya may enter the same dream again after exiting out of it. Of course, Ms. Maya doesn't know she is trapped inside a dream game. So whenever she finds a door she opens it without a second thought. And the administrators can monitor which door she has opened.

Now you are given the information of which doors Ms. Maya opened in the order she opened them. Your task is to write a program that will tell the administrators, how many dream worlds Ms. Maya is in and hasn't exited.

You better do a good job with this task. Or who knows what will happen to you. 🤓🤗

Input

The first line will have a single integer N, the number of doors Ms. Maya opened. The next line will contain N integers representing the numbers written on the doors.

All the integers in the input will be between 1 and 10000.

Output

Output a single integer, the number of dreams Ms. Maya is in at the end.

Sample Input	Sample Output
6 1 2 5 1 2 3	2
5 13 13 13 13 13	1

Here is what happens in the 1st case:

- Ms. Maya enters dream 1.
- Ms. Maya enters dream 2.
- Ms. Maya enters dream 5.
- Ms. Maya escapes from dream 1.
- Ms. Maya escapes from dream 2.
- Ms. Maya enters dream 3.

As we can see at the end Ms. Maya is still inside dreams 5 and 3. So the output is 2.

In the 2nd case, Ms. Maya enters dream 13 and then escapes from it. She again enters dream 13 and escapes. Finally, she enters dream 13 again but does not escape. So the output is 1.

Don't forget to print a newline at the end of the output.

If you are having a hard time solving this, here's a little tip/trick: Close your eyes for some time and play the game

Notes: Be careful about the newline('\n') at the end.

Problem Category: Loop
Problem Setter: Nazmus Sakib
Reviewer: Riadh Hasan

F. The Farewell Souvenir 🎁

Time Limit: 1s **Memory Limit:** 256 MB

Description:

People are going crazy about Squid Game these days ,you know, the Netflix series about a death game? You probably watched that show and thought, “This can never be real”. But Let me assure you that it is very real. In fact, **Stone-Infinity**, **Mr.SweetcAndy**, **Mr.Mouse** and **Jhunjhuni**, all four of them survived one. How? That story is for another time. Today I came here to tell you about the time they played tug of war in that game. As they aced the previous rounds by their strategies and intelligence, everyone wanted to be in their team. As selfless and kind hearted our Stone-Infinity is, he thought selecting teammates on the basis of strength is ruthless. Here stepped in our bigbrain **Mr.SweetcAndy** he suggested we select the candidates with an ambigram name.
What an ambigram, you ask? Well…

An ambigram is a string that stays the same even if it is rotated 180 degrees. For example in the figure1 we wrote yeah and then figure2 is the 180 degrees rotation of

figure1 figure 2

figure1. Both look exactly the same, don’t they?

So, here we can see ‘y’ can be used as ‘h’ after 180 degree rotation and ‘e’ can be used as ‘a’. But not every letter has a valid alternate letter after rotating it 180 degrees for example if I rotate k it does not make a valid letter. Here is a **list of all the letters that can be used in ambigrams.**

Letter	After 180 degree rotation
a	e
b	q
d	p
e	a
f	f
h	y
l	l
m	w
n	u
o	o

Letter	After 180 degree rotation
p	d
q	b
s	s
t	t
u	n
w	m
x	x
y	h
z	z

Now **Mr.Mouse** went to every player and collected their names and gave that to **Jhunjhuni**. Her job was to check which names of those are ambigram. She did a pretty good job thanks to the bare minimum programming skills she got and they formed a team and obviously won the tug of war.

Today is a programming contest, you are a contestant and we are in luck as I have that list of names too. So, can you write a program to check which names are ambigrams like she did that day?

Input

Given an integer N, the number of names in the list. After that in each line there is a string consisting of lowercase english letters (from a to z). There will be no punctuation or spaces in a name.

1<=N<=1000
1<=size of each name<=1000

Output

For each name print "**YES**" if it's an ambigram and "**NO**" if it is not an ambigram in a single line.

Sample Input	Sample Output
3 ace aboqe aoa	NO YES NO

Explanation:
For the 1st name, if we rotate the word the ‘c’ becomes an invalid letter. So, it’s not an ambigram.

ace => ɐɔǝ

For the 2nd name, if we rotate the word then the ‘a’ becomes ‘e’, the ‘b’ becomes ‘q’ the ‘o’ stays ‘o’, the ‘q’ becomes ‘b’ and the ‘e’ becomes ‘a’. So, the word still stays “aboqe”.

aboqe => aboqe

For the 3rd name, if we rotate the word then the ‘a’ becomes ‘e’, the ‘o’ stays ‘o’. So, the word becomes “eoe”. As the word doesn’t stay the same, the word is not an ambigram.

aoa => ɐoɐ

Notes: Be careful about the newline(‘\n’) at the end.

Problem Category: String
Problem Setter: Tanima Hossain
Reviewer: Albin

G. Green Light - Red Light

Time Limit: 1s **Memory Limit:** 512 MB

Description:

“It's never too late for a new beginning”

Do you remember the game we used to play as kids, when all the participants stood on the beginning line and one observer stood on the finishing line of the field, facing his back to the other players and counting one to ten? After finishing the counting, the observer turns around and observes to see whether anyone moves. If a player moves, he or she is eliminated. The game is won by all players who cross the finish line.

Inspired from that, **ZED** the crazy rich kid (also referred as ‘Chota Bruce Wayne’) created an open challenge for all. This challenge is a **variation** of that Green Light Red Light game. As humans we can’t hold our breath and stand still for long time. In this challenge, a lamppost with two types of light, red and green, is placed in the challenge ground. Players are allowed to move freely when the light is green, but not when it is red. If any player moves when the light is red, he/she will be eliminated. **After a certain time A, the lamppost's light will alternate between red and green. Time will start from 1 and initially the light will be Green.** (i.e., if A is equals to 11 then, the light will remain green from 1 till 11, then from 12 the light will alter and remain red till 22, then from 23 the light will again alter and remain green till 33, and so on). Each player will move exactly once in this game, which will be describe by start time S and end time E. The winners are the players who never moved in red light.

Surprisingly, **ZED** announces a massive award for all the players who can complete the challenge, the amount of which is beyond your wildest dreams. It's a little scary!! But no worries, he means no harm to any player who fails trying. N people accepted the challenge and it’s a huge number to maintain manually. So **ZED** wishes to automate this game. As he is not good at programming, he needs your help. Now you have to write a program to act as the game's observer, which will instantly **detect the number of players who completed the challenge.**

Input

On the first line, you'll be given two integers A and N. Then each of the next N lines will have information on the i'th player's movement. Each of these lines contains two integers S and E. **If the difference between S_i and E_i is equal to 0 then no movement will be detected for that player**. It is guaranteed that, the difference between Si and Ei is not more than 10^4.

$1 \leq A \leq 10^3$

$1 \leq N \leq 10^4$

$1 \leq S \leq E \leq 10^9$

Output

You have to output a single integer the number of total winners who completed the challenge.

Sample Input	Sample Output
11 7 1 8 1 3 80 90 2 3 66 75 90 95 25 50	4

Notes: Be careful about the newline('\n') at the end.

Problem Category: Add-Hoc
Problem Setter: Ahmed Abdullah Shourav
Reviewer: Md. Erfanul Islam

H. Conjuring 96: Ms. Kiana and the Ghost

Time Limit: 1s **Memory Limit:** 512 MB

Description:

Ms. Kiana is experiencing a **Ghost** in her house. That Ghost has been annoying her for a few days. So, she calls an exorcist to expel that Ghost from her house.

Let me tell you a secret. That Ghost is no one else but me. You might be wondering, what am I doing here? Well, that's a long story.

Just like humans, we ghosts have a society, which has some rules. Ghosts who break such rules are banished from society. Those ghosts roam around in the human world, some of them stay in human houses. Since they have nothing else to do, they just annoy those humans for fun. And, I was banished from society because I tried to cheat in the **Squid Game: Ghosts Edition.**

Now, the exorcist is trying to expel me from the house. The house has n floors, each floor has m rooms, each room has a number (not necessarily unique). I've got a hint about the exorcist (from other ghosts 😉). He hates numbers with many divisors. So, while performing exorcism, he ignores rooms that have the maximum number of divisors.

I've collected the numbers of all the rooms. But, we ghosts are weak in math's. So, I am asking you to help me find the number of rooms where I can hide while the exorcism happens. In other words, **you have to tell me what is the maximum number of divisors among all room numbers and how many rooms are there with that divisor count.**

Input

The first line of input contains a number T, the number of test cases.

Each test case starts with two numbers n and m, the number of floors, and the number of rooms on each floor. Next n lines contain m numbers each, the number of the rooms.

$1 \leq T \leq 20$

$1 \leq n,m \leq 100$

$1 \leq$ number on a room $\leq 2 \times 10^6$

Output

For each test case, print the case number as "**Case x:**", where x is the case number. Put a space right after it. Then print two space-separated numbers, the maximum divisor, and the number of rooms with maximum divisor. See the sample output for details.

Sample Input	Sample Output
2 2 2 8 9 12 8 2 3 12 24 36 36 12 24	Case 1: 6 1 Case 2: 9 2

Notes: Be careful about the newline('\n') at the end.

Problem Category: Implementation
Problem Setter: Shah Habibul Imran
Reviewer: Abu Saleh

I. The Game of Grid

Time Limit: 1s **Memory Limit:** 512 MB

Description:

New rules have been set for Squid Game. From now on, squid game will be 9 day long.

Today is the 8th day of the game. Players have to play another elimination game today to go to the final game.

The rule of today's game is a bit different from regular games. In today's game,

There will be an ∞ 2D grid in an ∞-size field. Let, **rows numbered from 1 to ∞ and columns numbered from 1 to ∞**. The value of each box of the grid will be g**enerated by multiplying that cell's row and column.**

Example of a 5*5 grid:

Column / Row	1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

Players will be in the position (1,1) when the game starts. They will be allowed to move only in the **adjacent position**(r,c+1)or position (r+1,c)at a time. To move from **one position to another takes one second only.**

Now, each of the players will be given **a random number N.** He/She will have to reach that number's position in the **minimum possible time**. If he/she takes even an extra second, that player will be eliminated. **The minimum possible time can only be achieved in the minimum possible number of moves made to reach the given number.**

The players are losing their confidence because they are struggling to find **the minimum number of moves taken to reach the given number**. Because not every player has a calm and programmer mind like yours. But you want to help them advance to the next level. So if you just tell them the minimum number of moves they can reach the position containing the given number, they will surely find a way to reach there in minimum possible time.

Given the random number N given to each player, you have to tell the **minimum number of moves** to reach the position that contains the given number.

Input

First line of the input contains an integer test case number T. The next T line will contain an integer N **the number you have to find in the grid**.

$1 \leq T \leq 100$

$1 \leq N \leq 10^{12}$

Output

Print output in this format "**Case X: Y**" (without quotation), where X is the test case number and Y is the number of minimum moves players need to reach the number.

Sample Input	Sample Output
4 1 2 3 1000000007	Case 1: 0 Case 2: 1 Case 3: 2 Case 4: 1000000006

In the third case,

Initially the player is in position (1, 1). The player has to go to the nearest position having 3 as its value.

Then, the player can go through this path (1, 1) -> (1, 2) -> (1, 3). The position (1, 3) contains 3.

So, the player can move to the desired position in 2 moves. And it is the minimum move to reach the position containing the number 3.

Be careful about the newline (‘\n’) at the end.

Problem Category: Number theory
Problem Setter: M. Nusrat Ullah
Reviewer: Rahat Islam Srijon

J. Behold! The Stopper!!!

Time Limit: 1s **Memory Limit:** 512 MB

Description:

You will be given an array *a* which has *n* integers. The array indices are numbered from 1 to *n*. There will be *m* queries. Each queries will be one of these two types -

1. **C l r k** - where **'C'** character indicates that, you have to print the **count of numbers** between indices *l* and *r* (inclusive) which have **at least *k* distinct prime divisors.**
2. **U l x** - where **'U'** character indicates that, you have to replace the value of *l*th indices of the array *a* with *x*.

Input

The first line will contain two integers, n and m. The second line will contain n integers. Then

m line will follow the queries as mentioned.

$1 \leq n,m \leq 2 \times 10^5$

$1 \leq a_i, x \leq 10^7$

$1 \leq l,r,l \leq n$

$0 \leq k \leq 9$

Output

For every query that starts with 'C' you have output "**Case X: Y**" where **X** is the number of type 1 queries starting from 1 and **Y** is the desired output.

Sample Input	Sample Output
10 3 2 3 4 5 6 7 8 9 10 11 C 3 9 2 U 4 12 C 3 10 2	Case 1: 2 Case 2: 3
7 4 12 8 2 10 4 60 30 C 2 4 1 U 3 210 U 5 11 C 1 6 2	Case 1: 3 Case 2: 4

Note: Please read the statement carefully.

Problem Category: Stopper

Problem Setter: Md. Erfanul Islam

Reviewer: Tanima Hossain, Riadh Hasan