

# **Problem set**

**DIU Take Off Programming Contest,  
Summer 2018**

## Index

### Problem Name

### Setter

<b>A.</b> You shall not pass!	Mehedi Imam Shafi
<b>B.</b> Census Taker Problem	Muhaiminul Islam Jim
<b>C.</b> Stupid Reality!	Mehedi Imam Shafi
<b>D.</b> Welcome to the dark side!	Pranto Das
<b>E.</b> Time Stone & Kolijar tukra	Mahmud Sajjad Abeer
<b>F.</b> Super Soccer	Debashish Saha Pranto
<b>G.</b> Nemesis	Nesar Ahammed Jony
<b>H.</b> Rescue the Avengers	Mehedi Hasan
<b>I.</b> Princess mAina (ময়না) and infinity gauntlet	Muhaiminul Islam Jim

## A. You shall not pass!

**Time Limit:** 0.5 second

**Memory Limit:** 1024 MB

### Description:

The war between Thanos and Avengers (Part 1) just ended. Earth is a mess. Many Avengers died trying to protect the planet and the people. People will remember them with due respect. With their leave Earth needs new defenders. But becoming an Avengers is never easy. The first step of this is obviously appearing for an immersive and prolonged test of might and powers called TOPC (Tolerance Obedience and Performance Check). Now you, a superhero, decided to join the team and lend your might. After applying you were given a passcode to get into Avengers' headquarter by *Successful Idris*, current chief of Avengers HQ. The passcode is "I still believe in heroes". So for warming you up in the contest you just have to print this line and get into the arena. You may copy the code given below as well.

```
int main()
{
    printf("I still believe in heroes\n");
    return 0;
}
```

### Input details

There is no input in this problem. Only write the code exactly and submit.

### Output details

Print "I still believe in heroes" without quotes. Don't forget to print a newline afterward. Or just copy and paste the code segment given above.

### Sample

Input	Output
/* There is no input for this problem */	I still believe in heroes

**Problem setter:** Mehedi Imam Shafi

**Special thanks:** Muhaiminul Islam Jim

## B. Census Taker Problem

**Time Limit:** 0.5 second

**Memory Limit:** 1024MB

### Description:

Who knows what dark days are ahead of us, as Thanos has finally collected all the infinity stones. He has already started visiting different planets and doing his thing. What's that? Snapping his fingers, what else? **And each time he snaps, the population of a planet gets decreased by half. But while he was visiting Knowhere, he snapped twice mistakenly.** Now as an employee of Intergalactic Census Takers, given the initial population (before any of the snaps) of Knowhere, **it's your job to calculate the population after the snaps. It's guaranteed that in no part of the calculation you'll have to face odd numbers or fractions.**

### Input details

Input contains an integer  $N$  ( $0 \leq N \leq 10^9$ ). Where  $N$  denotes the initial population of Knowhere.

### Output details

Print an integer, the population count after the snaps.

### Sample

Input	Output
100	25
16	4

**Note:** Don't forget to put a "new line" at the end of the output!

**Problem setter:** Muhaiminul Islam Jim

**Alternate writer:**

**Special thanks:**

## C. Stupid Reality!

**Time Limit:** 1.0 second

**Memory Limit:** 1024 MB

### Description:

The ability of Reality stone is very well-known. It can make anyone experience anything that the wielder of the stone wants. For example, if the wielder wants one to see a Wolf instead of a cat the person will see Wolf. Evil Thanos put his mind to torture Nebula with this stone. He makes her experience unbearable conditions. However, Nebula a very smart hybrid figured out a simple trick in its sleeve. **She figured the stone can only keep the made up reality for 2 and a half minute for each usage.** So each time Nebula starts experiencing something horrible she starts the countdown to see if it is real or made up. Now Nebula wants you who has access to her central system write a portion of code which will determine if any given experience of  $N$  seconds is real or not. **To simplify you will be given a time in seconds. If the time does not exceed the time limit of reality stone it's a made-up experience otherwise it is real.**

### Input details

Each input consists a single line denoting the experience duration in seconds.  $1 \leq N \leq 100000$

### Output details

Print **"Yes"** if the experience is real, **"No"** if the experience is not real (without quotes). Follow the exact output format given in the sample output.

### Sample

Input	Output
10	No
200	Yes

**Note:** Don't forget to put a "new line" at the end of the output!

**Problem setter:** Mehedi Imam Shafi

**Alternate writer:**

**Special thanks:**

## D. Welcome to the dark side!

**Time Limit:** 1.0 second

**Memory Limit:** 1024 MB

### Description:

Welcome to the second phase of Avengers Recruitment Program. As Tony Stark is busy fighting Thanos in Titan, Avengers' earth team is in short of scientists. So, we are recruiting scientists who'll work together to find a strategy to stop Thanos for good and will bring back order to our beloved earth. Now to get recruited you must solve the problem described below.

**Given  $a$ ,  $b$ ,  $c$  and  $d$ , you've to say whether  $(a^b)^c$  is equal to  $(a^b)^d$  or not.**

Solve this problem and find your place among the greatest superheroes of all times. It's never been this easier!

### Input details

The first line of input contains a line consist of four integers  $a$  ( $2 \leq a \leq 10^5$ ),  $b$  ( $1 \leq b \leq 10^5$ ),  $c$  ( $1 \leq c \leq 10^5$ ) and  $d$  ( $1 \leq d \leq 10^5$ ).

Check sample input for exact input format.

### Output details

Print **"YES"**(without quotes) if equal and **"NO"** ( without quotes) if not equal. Check the sample output for exact output format.

### Sample

Input	Output
2 2 2 4	NO
2 2 2 2	YES
4 3 3 4	NO

**Note:** Don't forget to put a **"new line"** at the end of the output!

**Problem setter:** Pranto Das

**Alternate writer:**

**Special thanks:** Muhaiminul Islam Jim

## E. Time Stone & Kolijar tukra

**Time Limit:** 1.0 second

**Memory Limit:** 1024 MB

### Description:

Guess who's the Greatest Of All Time? You might be thinking about Rolando or Mises. Poor you! C'mon, I'm talking about the whole Universe here! It must be Thanos, the greatest villain of all time.

But wait! Did you know he sucks at Mathematics? What a shame! But he knows who can do millions of calculations within a second, the programmers. So, he's captured your "Love of your life A.K.A. Tuntuni, Moyna, Jaan Pakhi, Kolijar Tukra" and asked you to solve a problem in exchange for your Jaanpakhi. You agreed as you're the best programmer of the Universe and you want to show how much you love your Jaanpakhi. Then Thanos explains a problem like this:- He wants to travel from **Xth** time dimension to **Yth** time dimension with his Time Stone but for that, he must know the Mana (Spell power) Cost to travel from **Xth** dimension to **Yth** dimension. The cost of traveling from **Xth** dimension to **Yth** dimension is defined as the sum from **X** to **Y** (inclusive). He'll give you **X** and **Y** and you have to tell him the mana cost to travel from **Xth** dimension to **Yth** dimension.

### Input details

You'll be given two integers **X** and **Y**. The input will be such that the value of **X** and **Y** will be between **1** to **50000** and **X** will always be less than **Y**.

### Output details

Print the cost as a single integer as required on the problem statement.

### Sample

Input	Output
1 10	55
5 15	110

**Note:** Don't forget to put a "**new line**" at the end of the output!

**Problem setter:** Mahmud Sajjad Abeer

**Alternate writer:** Muhaiminul Islam Jim

**Special thanks:**

## F. Super Soccer

**Time Limit:** 1.0 second

**Memory Limit:** 1024 MB

### Description:

The football world cup fever has touched the superheroes and supervillains too. Now to decide earth's fate, instead of fighting Avengers and Black Order has decided to face each other in a football match. If the Avengers win, Black Order will leave earth for good. Or else, they are gonna kill half of the total population.

Rules of this football match is a bit different. **Winner team is decided by the number of total successful passes, not by the number of goals.** A successful pass is the pass in which a player passes the ball to another player of the same team. Now, given the sequence of passes, you've to tell the world who won the match.

### Input details

Input starts with an integer  $T \leq 1000$ , denoting the number of test cases.

Each case contains an integer  $2 \leq N \leq 10^5$ .

The next line contains a string of length  $N$ .

Each string contains a sequence of characters **A** and **B** which denotes Avengers and Black Order respectively. Each character except the first one denotes the current ball possession after the pass from the previous player. For a clearer understanding, check the sample input.

### Output details

For each case, print the case number and the winning team's name.

Check sample output for exact output format.

### Sample

Input	Output
2 8 AAABBAAA 5 AABBB	Case 1: Avengers Case 2: Black Order

**Note:** In the first test case, total seven passes took place. Avengers passed the ball successfully 4 times while Black order could do it only once, rest two were unsuccessful passes. Thus, the winner is Avengers.

**Problem setter:** Debashish Saha Pranto

**Alternate writer:** Mehedi Hasan

**Special thanks:** Muhaiminul Islam Jim



## G. Nemesis

**Time Limit:** 3.0 second

**Memory Limit:** 1024 MB

### Description:

**Peter:** Mr. Stark, I don't feel so good.

**Tony Stark:** Are you all right?

**Peter:** I don't know what's happening.

**Peter:** I don't want to go, I don't want to die, sir, please I don't want to go, I'm sorry.

Peter said those before disintegrating in Tony's arms.

How does Avengers: Infinity War end? You asked me. And my broken heart again started crying.

As you hopefully know that, this epic film ends with Thanos vaporizing half of the universe with a dramatic snap of his fingers. Thus, approximately half of our beloved heroes turn into dust on the spot. Once Thanos literally snaps, a few unlucky characters begin to turn into ash, and for the most part, it seems they can't even feel what's happening with them!!!

Whether it's because of his spidey sense or not, Peter realizes what's happening long before his companions. He reaches out for his mentor Tony Stark/Iron Man. When he starts to fade, tearfully telling him stuff like "I don't want to die, I don't want to go....."

Every Avengers tremendously desperate to take revenge for killing their friend Peter.

That's why Avengers team leader Tony Stark finally ended up making a new team. The decision is final that they would defeat Thanos. But Thanos (The Mad Titan) has strong soldiers. As you are a great programmer of planet Earth. Tony Stark has come to you and he seeks help from you. That is, you have to calculate the strength of both teams and inform the result to him. Mr. Stark will give you the Strength range information for all soldiers on his team and Thanos team. You have to say that who will win the fight. **The strength of a soldier is determined by the sum of all numbers in the given strength range (inclusive).**

### Input details

The first line will contain an integer  $T$  ( $1 \leq T \leq 100$ ) denoting the number of test cases. Then on each test case you will be given Two space-separated Integer  $N$  ( $1 \leq N \leq 10^4$ ) and  $M$  ( $1 \leq M \leq 10^4$ ) Where,  $N$  and  $M$  represent the number of the soldiers of Avengers team and Thanos team. Next,  $N$  line contains Two integers  $A$  and  $B$  ( $1 \leq A \leq B \leq 10^7$ ), which denote the strength range of the  $i$ th soldier of Avengers team. And next  $M$  line contains two integers  $A$  and  $B$  ( $1 \leq A \leq B \leq 10^7$ ), which denote the strength range of the  $i$ th soldier of Thanos team.

### Output details

For each test case print "Case #X: "(without quotes) Where  $x$  is the running test case number. Then print the message "Avengers"(without quotes), if the total strength of all soldiers from the

Avengers team is greater than the total strength of Thanos team. If the strength of Thanos team is greater than Avengers team print “Thanos”. Otherwise, print “Draw” if the strength of both teams is equal

### Sample

Input	Output
1 3 4 1 2 2 3 3 45 4 5 1 1 2 2 1 2	Case #1: Avengers

### Note:

**Explanation:** In the above test case, the Avengers team has 3 soldiers and Thanos has 4 soldiers.

**Strength of the Avengers team :**

**1st soldiers:**  $1 + 2 = 3$

**2nd soldiers:**  $2 + 3 = 5$

**3rd soldiers:**  $3 + 4 + \dots + 45 = 1032$

**Total strength** =  $3 + 5 + 1032 = 1040$

**Strength of Thanos team :**

**1st soldiers:**  $4 + 5 = 9$

**2nd soldiers:** 1

**3rd soldiers:** 2

**4th soldiers:**  $1 + 2 = 3$

**Total strength** =  $9 + 1 + 2 + 3 = 15$

**Problem setter:** Nesar Ahammed Jony

**Alternate writer:** Pranto Das

**Special thanks:**

## H. Rescue the Avengers

**Time Limit:** 1.0 second

**Memory Limit:** 1024 MB

### Description:

The mighty Thor (GOD of THUNDER) is the **only** living Avenger in the universe. He is preparing for the final battle against Thanos. But it's impossible to beat Thanos without all the Avengers. Luckily, Thor has found an ancient secret Infinity Stone named the Rescue Stone. It's possible to rescue all the Avengers with the help of this rescue stone. But there is a catch. **By using this stone, maximum N person(s) can be rescued on a day if N person(s) are alive.** After a sudden day, it's impossible for the Avengers to beat Thanos. So Thor wants to know how many days it would take to rescue all the Avengers.

Sadly, Thor sucks at mathematics. So, he needs your help to know how many days he would require to save all the Avengers.

### Input details

The input will start with **T** ( $1 \leq T \leq 100$ ) where T denotes the number of test cases. Next T lines will contain an integer **N** ( $1 \leq N \leq 109$ ), number of all Avengers **including Thor**.

### Output details

For each case, print the case number and the minimum number of days required to rescue all the Avengers. See the sample for exact formatting.

### Sample

Input	Output
2	Case 1: 1
2	Case 2: 2
4	

### Note:

**Problem setter:** Mehedi Hasan

**Alternate writer:**

**Special thanks:**

# I. Princess mAina (ময়না) and infinity gauntlet

**Time Limit:** 3.0 second

**Memory Limit:** 6800 MB

## Description:

It is the year of 2025, all members of the Avengers are dead. And using the reality stone, Thanos has created a reality where there are too many Infinity Stones and to put the world back in order, all the infinity stones need to be collected by someone with a pure soul. But all the members of Avengers are dead. Who will complete this apparently impossible task?

That's where Princess mAina comes in. She's gonna collect the infinity stones and with her super powerful spell "Antic Utter" she'll kill all the villains who come in between.

Princess mAina has an infinity gauntlet of size  $N$ . Every time she collects an infinity stone she puts it in one of the empty slots of her gauntlet. And from time to time, she needs to calculate the total number of infinity stones within a range  $L$  to  $R$  (**inclusive**) for purely research purposes. As princess mAina is super busy killing the notorious villains, she needs your help doing these things. Princess mAina will send you texts when she needs your assistance. She sends two types of texts:

*Text format 1: 1 n*

Which means she has collected a new stone and has put that on slot number  $n$ . You don't need to send a reply to this type of texts.

*Text format 2: 2 l r*

Which means she needs to know how many infinity stones are there in between slot number  $L$  and  $R$  (inclusive). You need to reply back with the number of infinity stones in this range when this type of texts arrives.

Now get ready and help her save the world.

## Input details

Input starts with an integer  $T$ , denoting the number of test cases. Each test case starts with two numbers  $N$  total number of slots in the infinity gauntlet of Princess mAina and  $Q$ , total number of texts you'll receive. Next  $Q$  lines contain one of the two types of aforementioned texts.

## Constraints:

$$T \leq 5$$

$$1 \leq N, Q \leq 100000$$

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

*Check sample input for exact input format.*

## Output details

For each test case, print the case number followed by all the texts you send back to Princess mAina.

*Check sample output for exact output format.*

## Sample

Input	Output
2	Case 1:
4 5	1
1 2	1
2 2 4	0
1 1	Case 2:
2 2 3	1
2 3 4	
4 5	
1 1	
1 4	
1 2	
1 3	
2 4 4	

**Note:** Dataset is huge. Use faster I/O.

**Problem setter:** Muhaiminul Islam Jim

**Alternate writer:** Pranto Das

**Special thanks:**