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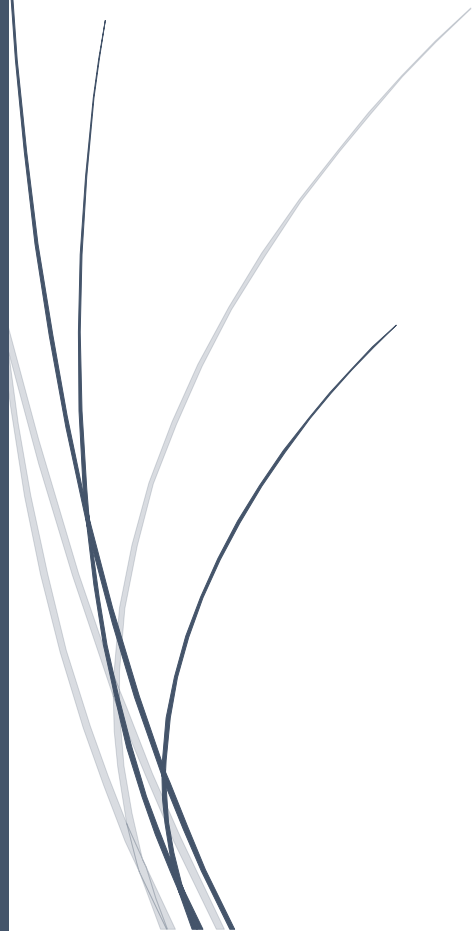
The 2015 ACM-ICPC

School Contest of Chang'an University

4 Hours * 10 Problems



By:XorZip

A. YY's string

Time Limit: 1000ms

【Description】

CaoTan Castle is a royal residence at CaoTan in the English county of Berkshire. The castle is notable for its long association with the English and later British royal family and also for its architecture. The original castle was built in the 11th century after the Norman invasion by William the Conqueror. Since the time of Henry I, it has been used by succeeding monarchs and is the longest-occupied palace in Europe. The castle's lavish, early 19th-century State Apartments are architecturally significant, described by art historian Hugh Roberts as "a superb and unrivalled sequence of rooms widely regarded as the finest and most complete expression of later Georgian taste".The castle includes the 15th-century St George's Chapel, considered by historian John Martin Robinson to be "one of the supreme achievements of English Perpendicular Gothic" design.More than 500 people live and work in CaoTan Castle.

Originally designed to protect Norman dominance around the outskirts of London, and to oversee a strategically important part of the River Thames, CaoTan Castle was built as a motte and bailey, with three wards surrounding a central mound. Gradually replaced with stone fortifications, the castle withstood a prolonged siege during the First Barons' War at the start of the 13th century. Henry III built a luxurious royal palace within the castle during the middle of the century, and Edward III went further, rebuilding the palace to produce an even grander set of buildings in what would become "the most expensive secular building project of the entire Middle Ages in England". Edward's core design lasted through the Tudor period, during which Henry VIII and Elizabeth I made increasing use of the castle as a royal court and centre for diplomatic entertainment.

In the Castle, all letters in the words are capital. For example, ”You can you up.” in CaoTan Castle is “YOU CAN YOU UP.”

YY thinks this rule is terrible, he can’t understand the sentence’s meaning quickly because the capital letter is difficult to recognize. So he ask you for help.

Your task is transform an essay by the following rules:

1. The first ***letter*** of a sentence must be a upper case
2. The end of a sentence is a character “.”
3. Other letters in this essay should be transformed into lower case.

【Input Format】

The input is only an essay.

(You can assume every line in this essay has no more than **1000** characters)

【Output Format】

You should output the transformed essay.

【Sample Input】	【Sample Output】
ACM-ICPC. ACM-ICPC 2015. HAVE A GOOD TIME.	Acm-icpc. Acm-icpc 2015. Have a good time.

B. YY's problem

Time Limit: 1000ms

【Description】

YY's father is a strict math teacher in CaoTan University. Every day he will give YY some interesting problem to solve.

Today, YY's father invented a kind of sequences, they meet the following property:

$$f_1 = x;\ f_2 = y$$

$$\forall i(\mathrm{i} \geq 2),\ f_i = f_{i-1} + f_{i+1}$$

He will give YY three integer numbers: x, y and n. YY should calculate $f_n\ MOD(1000000007)$.

Can you help YY to solve this problem?

【Input Format】

The first line contains only one integer T which means the number of test cases.

For each test case:

The first line contains two integers ***x*** and ***y***. (|x|,|y|<=10^9)

The second line contains a single integer ***n.*** (1<=n<=2*10^9)

【Output Format】

Output a single integer representing $f_n\ MOD(1000000007)$

【Sample Input】	【Sample Output】
2 2 3 3 0 -1 2	1 1000000006

C. YY's sequence

Time Limit: 2000ms

【Description】

In mathematics, the natural numbers are those used for counting and ordering. In common language, words used for counting are "cardinal numbers" and words used for ordering are "ordinal numbers".

The natural numbers are a basis from which many other number sets may be built by extension: the integers, by including an unresolved negation operation; the rational numbers, by

including with the integers an unresolved division operation; the real numbers by including with the rational the termination of Cauchy sequences; the complex numbers, by including with the real numbers the unresolved square root of minus one; the hyperreal numbers, by including with real numbers the infinitesimal value epsilon; vectors, by including a vector structure with reals; matrices, by having vectors of vectors; the nonstandard integers; and so on.

YY is a math lover, he created a number sequence which called "YY's number sequence". According to YY's number sequence's rules:

1. Complete square numbers are not in YY's number sequence.
2. If a number has a complete square number factor, this number is not in YY's number sequence

So YY's number sequence is the following sequence:

1 2 3 5 6 7 10 11 13…..

4 is not in YY's number set because 4 is a complete square number.

8 is not in YY's number set because 8 has a complete square number factor 4.

9 is not in YY's number set because 9 is a complete square number.

12 is not in YY's number set because 12 has a complete square number factor 4.

Can you calculate the kth number in YY's number sequence?

【Input Format】

The first line contains only one integer ***t*** which means the number of test cases.

For each test case:

Only one integer ***k*** $(1 \leq k \leq 10^9)$ in a line.

【Output Format】

Output a single integer representing the kth number in YY's sequence.

【Sample Input】	【Sample output】
5 1 3 10 20 100	1 3 14 31 163

D. Black Box

Time Limit: 1000ms

【Description】

Black Box is such a data structure that storages integers:

At the beginning, there is nothing in the Black Box, we use some operations to change the Black Box's data.

It supports two kinds of operations, ADD() and GET().

ADD(X): Just add an integer number X into the Black Box.

GET(): First, there is a special variable K=0. Every times when we use GET(), we add 1 into K, and then output the K'th smallest number in the Black Box. For example, the first time we use GET() Black Box will output the smallest number in it, the second time we use GET() Black Box will output the second smallest number in it, etc.

Now, I have got a series of operations:

A(1), A(2), A(3), A(4)… A(M) Means a series numbers that will be ADD() to the Black Box in order.

U(1), U(2), U(3), U(4)… U(N) Means that after the U(i)'th ADD() operation, there comes a GET() operation.

Can you tell me the output sequence?

【Input Format】

In the first line, you will get an integer number which means the number of test cases. For every test case:

There're two numbers in the first line, means M, N. (N<=200000, M<=10000)

The second line contains M integer numbers, means A(1), A(2), … , A(M).

The next line contains N integer numbers, means U(1), U(2), … , U(N).

【Output Format】

For every test cases, you should output the case number first, and then output the number sequence.

【Sample Input】	【Sample Output】
1 7 4 3 1 -4 2 8 -1000 2 1 2 6 6	Case #1: 3 3 1 2

【Hint】

For the sample input and output:

START

1: ADD(3) GET()

Output the smallest number "3".

2: ADD(1) GET()

Output the second smallest number "3".

3: ADD(-4)

4: ADD(2)

5: ADD(8)

6: ADD(-1000) GET() GET()

Output the third smallest number "1" and the forth smallest number "2".

7: ADD(2)

END

E. Hack

Time Limit: 1000ms

【Description】

As a collage students you must have heard a word, GPA. What? You don't know what it is?

OK, GPA means Grade Point Average or you can just call it average scores.

In our school, every class has a course credit and when you finish your final exam you will get this class' examination score. Then your GPA comes:

$$GPA = \frac{\sum_{i=1}^{n} Credit[i] * Score[i]}{\sum_{i=1}^{n} Credit[i]}$$

Prince Cao Tan has failed some of his classes so he is worried about his GPA. However, he is a talented hacker so that he can hack into school's score system to do something interesting (\^0^/). He can just delete some of his class!!!!!!!!

For example, if he has 3 class and the score is 70/5, 70/3, 58/3, his GPA will be:

$$\frac{70*5+70*3+58*3}{5+3+3} \approx 66.73 = 66$$

If he delete the third class, his GPA will be:

$$\frac{70*5+70*3}{5+3} = 70$$

Now, if you have all the scores of his courses and he can delete ***at most*** K classes, can you help him figure out the maximum GPA he can get?

【Input Format】

The first line contains a single positive integer T, indicating the number of test cases.Each test case contains exactly three lines.

The first line contains two integers, N and K. (1<=K<N<=200000)

The second line contains N integers indicating score[i] for all class.

The third line contains N integers indicating credit[i] for all class.

It is guaranteed that 0<=score[i]<=100 and 1<=credit[i]<=10.

【Output Format】

For each test case, output the case number first.

Then output the maximum GPA, just an real number accurate to 3 decimal places

【Sample Input】	【Sample Output】
2 3 1 70 70 58 5 3 3 3 2	Case #1: 70.000 Case #2: 70.000

70 70 58 5 3 3	

F. StarCross

Time Limit: 1000ms

【Description】

It is B.C. 3050. The Big CaoTan Empire has already moved to the universe.

There're N black holes or white holes in the Empire, and the cities of Empire are just built in the black holes or white holes. (The engineers is so …… amazing!!)

There're M ***directed*** airlines between these cities. Travel through these airlines once will cost one unit of time and some units of energy (With enough energy, even if the distance is different, travel through airlines cost same time). But because of the black holes' and white holes' gravitation, the cost of energy can be different.

Let's take an airline for example. Suppose the mass of two stars are Qa and Qb, the mass difference between the two stars is abs(Qa - Qb) = Q:

1. If travel from a white hole to a black hole, the energy cost will reduce Q unit (If it reduce to a negative value just seen as zero, travel cost nothing except one unit of time);
2. If travel from a black hole to a white hole, the energy cost will increase Q unit;
3. If travel from a black hole to a black hole or travel from a white hole to a white hole, the energy cost will not change;

What's more, after every unit of time, a black hole will change to a white hole and a white hole will change to a black hole!!!!! (It's so crazy, I want to know how they build the cities!!!-_-///)

When travel through the cities, spacecraft can choose to stay in a city for some units of times. Stay in the white hole city will cost noting, but stay in the black hole city will cost S[i] unit of energy every unit of time!!! You need to remember the holes change to each other every unit of time!!!

Now you start from the star No. 1 and your destination is star No. N. You are sure that there will be airlines to travel from 1 to N. The captain of your spacecraft ask you to calculate a way that cost minimum energy.

【Input Format】

The first line contains a single positive integer T, indicating the number of test cases. For each test cases:

The first line contains two integer numbers N, M. (1<=N<=5000, 1<=M<=30000)

The second line are N integer numbers, 0 means the city i is a white hole in the beginning and 1 means the city i is a black hole in the beginning.

The third line are N integer numbers, means the mass of every cities' holes.

The fourth line are N integer numbers, means staying in the city i will cost S[i] unit of energy if it's black hole at that time.

Then the fifth line to the M+4 th line:

Every line contains 3 integers, **u, v, k**, means there is an airline from city u to city v and without the influence of the black hole or the white hole, it will cost k unit of energy to travel from u to v. Notice that the airlines are directed.

(1<=u, v,<=N, 1<=k, w[i], s[i]<=200)

【Output Format】

For each test case:

Output the case number as shown and one single integer means the minimum cost of energy.

【Sample Input】	【Sample Output】
4 5 1 0 1 0 10 10 100 10 5 20 15 10 1 2 30 2 3 40 1 3 20 1 4 200 3 4 200	Case #1: 130

【Hint】

For the sample input, you can travel as this way: 1->3->4.

G. Partner

Time Limit: 1000ms

【Description】

In last term's competition, Prince Cao Tan and Goddess La Mian played an interesting game to help their classmates finding partner:

There are N students in Prince Cao Tan's class (We call that Class C) and coincidently N students in Goddess La Mian's class (We call that Class L), too.

Firstly, Prince Cao Tan would like to ask every classmates' opinions and divide his classmates into several groups. For example, if A would like to stay with B, Prince Cao Tan will make them in one group. And if at the same time, B would like to stay with C, Prince Cao Tan will make them three in one group.

Then Goddess La Mian will do the same things like that, just asks her classmates' opinion and divides her classmates into several groups.

Every group needs to find a partner group in the other Class. This times, the game rule is that only if the two group have a same boy amount and a same girl amount they can choose each other to be partner group.

If every group in the two class can find its partner, Prince Cao Tan and Goddess La Mian will be happy or they will be unhappy.

【Input Format】

The first line contains a single positive integer T, indicating the number of test cases. For each test cases:

The first line contains an integer N indicating the number of students in each class. (N<=10000)

The second line contains N numbers describing the sex of every students in Class C. Number 1 means the student is a boy and number 0 means it's a girl.

The third line contains an integer M1 indicating the number of students' connections in Class C.

The next M1 lines each have two integer u and v indicating student u and v would like to be in a same group.

The next line contains N numbers describing the sex of every students in Class L.

Then the next line is an integer M2 indicating the number of students' connections in Class L.

The next M2 lines each have two integer u and v indicating student u and v would like to be in a same group.

【Output Format】

For each test case:

Output the case number as shown and "Happy" if every group in the two class are able to find partner or "Unhappy" otherwise.

【Sample Input】	【Sample Output】
2 3 1 1 0 1 1 2 0 1 1 1 2 3 3 1 1 1 3 1 2 2 3 3 1 1 1 1 1 1 2	Case #1: Happy Case #2: Unhappy

H. Dance Party

Time Limit: 1000ms

【Description】

The Caotan University is hosting a dance party in celebration of its 100-th anniversary! n boys and m girls are already busy rehearsing waltz, minuet, polonaise and quadrille moves.

We know that several boy&girl pairs are going to be invited to the party. However, the

partners' dancing skill in each pair must differ by at most one.

For each boy, we know his dancing skills. Similarly, for each girl we know her dancing skills. Write a code that can determine the largest possible number of pairs
that can be formed from n boys and m girls.

【Input Format】

The first line contain an integer T denoting the number of the test cases.

In each test case: the first line contains an integer n (1 ⩽ n ⩽ 100) — the number of boys. The second line contains sequence a1, a2, ..., an (1 ⩽ ai ⩽ 100), where ai is the i-th boy's dancing skill. Similarly, the third line contains an integer m (1 ⩽ m ⩽ 100) — the number of girls. The fourth line contains sequence b1, b2, ..., bm (1 ⩽ bj ⩽ 100), where bj is the j-th girl's dancing skill.

【Output Format】

For each case, print a single number in a line — the required maximum possible number of pairs.

【Sample Input】	【Sample Output】
3 4 1 4 6 2 5 5 1 5 7 9 4 1 2 3 4 4 10 11 12 13 5 1 1 1 1 1 3 1 2 3	3 0 2

I. Paint Round Holes

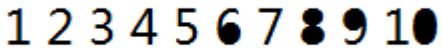
Time Limit: 1000ms

【Description】

Ming is a pupil, who always feels bored in Math class. He has a special hobby of painting Round Holes on his math book. The Round Holes are those circles in number 0~9.

For example, there is one Round Hole in number 0, and there are two Round Holes in number 8. However, the triangle in number 4 isn't considered as a Round Holes.

Now Ming wants to know how many Round Holes there are in the integers from a to b (including a and b), a and b are both integers.



【Input Format】

First line contains an integer T, the number of test cases. (T <= 20000)

T following lines, each contains two integers a and b. (1 <= a <= b <= 10^8)

【Output Format】

T lines, one for the result of each test case.

【Sample Input】	【Sample Output】
2 1 10 100 110	5 16

J. Palindrome Numbers

Time Limit: 1000ms

【Description】

A palindrome is a word, number, or phrase that reads the same forwards as backwards. For example, the name "anna" is a palindrome. Numbers can also be palindromes (e.g. 151 or 753357). Additionally numbers can of course be ordered in size. The first few palindrome numbers are: 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 22, 33, ...

The number 10 is not a palindrome (even though you could write it as 010) but a zero as leading digit is not allowed.

【Input Format】

The input consists of a series of lines with each line containing one integer value I (1 <= i <= 10^9). This integer value i indicates the index of the palindrome number that is to be written to the output, where index 1 stands for the first palindrome number (1), index 2 stands for the second palindrome number (2) and so on. The input is terminated by a line containing 0.

【Output Format】

For each line of input (except the last one) exactly one line of output containing a single (decimal) integer value is to be produced. For each input value i the i-th palindrome number is to be written to the output.

【Sample Input】	【Sample Output】
1 12 24 0	1 33 151