PROGRAMMING CONTEST PROBLEM SET

This problem set contains 10 problems (A-J)

15th November 2020

A. Excel

Time Limit: 10 seconds
Author: Ariff

Salman is an analyst that is involved in reporting. Every day he will prepare a financial report for his team leader to be presented to the management. This task is repetitive as he needs to extract the data and do the analysis, then put it in a report format.

However, after quite some time he decides to automate this task. He divides the process of making the report into several sub-processes which he will tackle one by one. There is one process he needs to convert the column index in his data into excel column format. This process is needed as he may need to do some processes like *conditional formatting*, which is to highlight the data based on the scales given.

In Excel, the first column has number A, second has number B, third has number C, till the last column 26 which is number Z. After finishing the one-letter number, continue with two-letter starting with column 27, has number AA. Next column 28 has number AB, till column 52 has number AZ. For two-letter numbers it will last with ZZ, after that it will start with three-letter numbers and so on.

Salman has asked your opinion to help him convert the column index into Excel column number.

Input

The first line contains n ($1 \leq n \leq 50$) (number of indexes) and i ($1 \leq i \leq 10^6$) (index of the column).

Output

Show the column number in Excel format

| Sample Input	Sample Output
4	A
1	AA
27	BC
55	AAL
714	

B. Not Another Math Question

Time Limit: 1 seconds
Authors: Syaafiq & Azrai

Siti is given X horizontal lines and Y vertical lines. These lines intersect and create some rectangles. She needs to count all the rectangles (with sub rectangles) in the figure. Siti needs your help to figure this problem out. Help Siti by writing a code to solve this problem. Note: Lines go infinitely in both directions. Refer to figures below.
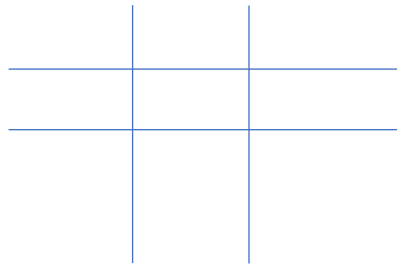
2 horizontal, 2 vertical = 1 rectangle
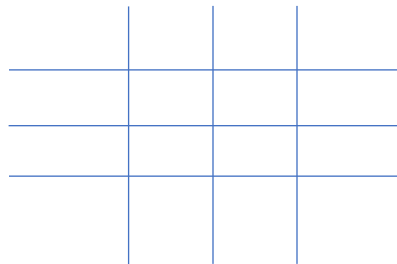
3 horizontal, 3 vertical = 9 rectangles can be constructed (including sub-rectangles)

Input

First line contains T, the no. of test cases. Each test case contains two integers, X and Y, separated by a space.

Constraint

$1 \leq T \leq 100$
$0 \leq X, Y \leq 10^5$

Output

For each test case, print the total number of rectangles in the figure in a newline.

Sample Input	Sample Output
3 2 3 3 4 2 2	3 18 1

C. Joe's Words

Joe is a good speaker. He always chooses sentences that have the highest score in his own calculation. He is asking you to help him to calculate the score. The score for a sentence is the sum of the 3 highest value word.

Score = Sum of Index of that letter in the alphabet (1 indexed).

Input

First line contains an integer T for the test cases. Second line contains the number of words, N.

Constraint

1<= T <=100

5 <= N <= 100

The words are case insensitive

Output

Print the score of the sentence.

Example:

A = 1, b = 2, aB = 3

3 words with the highest score of case #1

TwentyTwenty = 214, Prosolve = 122, National = 86; Total: 422

Sample Input	Sample Output
2 5 Welcome to Prosolve National TwentyTwenty 6 Good luck and have fun everyone	422 445

D. Let's Count Characters!

Time Limit: 10 seconds
Author: Ariff

Fatimah has a daughter named Qistina. Qistina is 4 years old kid. However, she is very smart, she is able to read books and count numbers without any problem.

On a fine day evening, Fatimah gives her a quiz to test her reading and counting skill, to see whether she can pass the quiz or not. The quiz will be given a string that consists of:

- Uppercase and lowercase letters,
- Underscore symbols (used as separators),
- Parentheses (opening and closing)

What she needs to do is find the:

- Words in parentheses and
- Show the count of the word with the highest number of characters

Example:

"_Jom__makan_(nasi_goreng_ayam)_dekat_(kedai_mamak_)"

The answer would be 6, as "goreng" has 6 characters, compared to ["ayam","nasi"] which have 4 characters and ["kedai", "mamak"] have 5 characters .

If there's no word in the parentheses, then print 0.

Input

The first line contains $n\,(1 \leq n \leq 50)$ (number of strings) and continue with the string consisting of only lowercase and/or uppercase, parentheses and/or underscore symbols.

Output

Print the highest number of word characters in parentheses.

Sample Input	Sample Output
3 _Jom__makan_(nasi_goreng_ayam)_dekat_(kedai_mamak_) _(i_like_)_durian	6 4 8

(Please_answer_this_question)_____in_(one_minutes)_ya	

E. Crypt
Time Limit: 1 seconds
Author: Shahril

Ali and his team have been tracking one criminal group that has been causing cyber chaos throughout the nation. After several months of investigating, they have managed to found an old computer that contained secret information about the organization.

After doing the forensic investigation from the old computer, they managed to excavate some crucial data, which unfortunately seems to be rendered unreadable. They also found the **C code** responsible for transforming the data, which is given as below.

```
void encrypt(char* data, int datalen, const char* key, int keylen)
{
    for (int i = 0; i < datalen; i++) {
        data[i] ^= key[i % keylen];
    }
}
```

This function accepts four arguments, which ***data (plaintext)*** array is transformed to another form **E**, influenced by the data in the ***key*** array. After further digging, they have managed to recover the front-chunk from the original data (plaintext). They have also managed to extract the ***keylen***. Unfortunately, ***key*** is not recoverable as the sectors responsible to hold the data is corrupted.

Using the available data, Ali and his team tried to crack the code for a few days now, but didn't succeed so far. Being desperate, Ali has approached you, asking for help. Can you help Ali to uncover the secret data?

Input

The first line contains T ($1 \le T \le 128$), the number of test case(s).

For the following T test cases, there will be another three (3) lines of data which correspond to each test.

First line of the test case contains string E ($1 \le length(E) \le 1024$) (transformed-data), in **hexadecimal string format**. The hexadecimal string is ended by a newline.

Second line of the test case contains an integer KL ($1 \le KL \le 16$) (keylen), which is the recovered key length.

Third line of the test case contains RP ($1 \leq length(RP) \leq 1024$) (recovered-plaintext), which contains front-chunk from the original data (plaintext) in **hexadecimal string format**. The hexadecimal string is ended by a newline. RP is guaranteed to be **printable**.

They also noticed that $KL \leq length(RP)$, which is crucial in order to break this algorithm.

Output

Given the KL, RP, and E, recover full original data before it is transformed into E under **key** influence. **key** is not available, so use the available resources to achieve this task. The original data is guaranteed to be printable.

Sample Input	Sample Output
3 20000000491a18450d59114806010014020b185d540c080708 10 54686973206973207468 32010e061b164b0a0c46540006044907030c0a1203071b18 10 466967757265206f757420686f 33070617491f1e06121315060d5301121d005955010648 10 476f6f64206c75636b2061	This is the original data Figure out how this work Good luck and have fun!

Explanation for Test Case 1:

- First data is "20000000491a18450d59114806010014020b185d540c080708", which can be converted to C-notation as **"\x20\x00\x00\x00\x49\x1a\x18\x45\x0d\x59\x11\x48\x06\x01\x00\x14\x02\x0b\x18\x5d\x54\x0c\x08\x07\x08"**.

- Second data is the key length, which in this case is 10.

- Third data is the recovered front-chunk from the original data (plaintext) "54686973206973207468", which can be converted to C-notation as "**\x54\x68\x69\x73\x20\x69\x73\x20\x74\x68**". Also, it has been mentioned that this is printable, so in ASCII notation this is "**This is th**".

Based on above information, you need to use them in some way to un-reveal the original data from the transformed data (**E**). Which in this case, the original plaintext is "This is the original data".

F. Bandwidth

Time Limit: 1 seconds
Author: Shahril

Ali and his mate, Abu, are tasked with mapping the internet connectivity between all the internet hotspots that are available in Town X. Following this endeavour, one of their *to-do* checklists is to calculate all the bandwidth that is possible to transfer between the hotspots in the town. Bandwidth in this context means maximal number of data per unit time that can be transmitted from one node to the next.
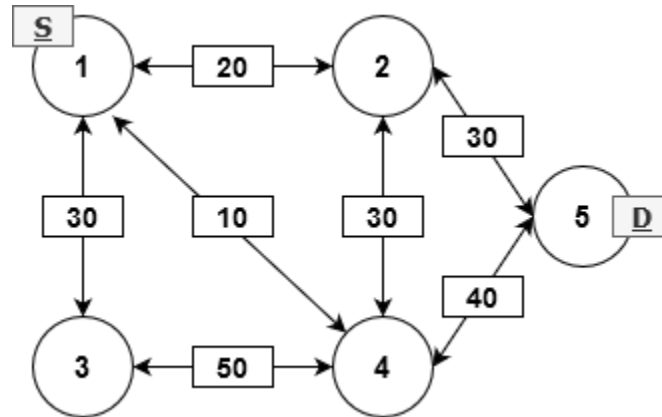
In the above example, there are five hotspots locations in town X. The lines with the value are the number of data that can be transmitted per unit time between the nodes. The bandwidth direction is **bi-directional**, meaning that both in/out have the same amount of bandwidth (which in the real world, this is not true, but just assume this way for this question).

In this example, the starting point **S** is on **node 1**, and the ending point **D** is on **node 5**. There are three paths that the network could take to simultaneously transmit the data:

- 1→2→5 (possible to transfer **20** data)
- 1→4→5 (possible to transfer **10** data)
- 1→3→4→5 (possible to transfer **30** data)

This means that to transfer data from **node 1** to **node 5**, it is possible to transfer **60** amounts of data at a time.

Now, Ali... he is lazy ;) . He knows that you are a great programmer that can do magic stuff. Ali requested that you create a program that could calculate the maximum number of bandwidth that can be transmitted from **S** to **D**. Can you help him?

Input

The first line contains N ($1 \leq N \leq 50$) (number of nodes) and C ($1 \leq C \leq N * N$) (number of connections between the nodes).

The following C lines contains U ($1 \leq U \leq N$)(first node), V ($1 \leq V \leq N$)(second node), and B ($1 \leq B \leq 1000$)(the bandwidth between the U and V).

The last line contains S ($1 \leq S \leq N$) and D ($1 \leq D \leq N$), which denotes the **starting node** and the **destination node**.

Output

Calculate the maximum amount of bandwidth possible to transfer data from point S to point D.

Sample Input	Sample Output
5 7 1 2 20 1 3 30 1 4 10 2 4 30 2 5 30 3 4 50 4 5 40 1 5	60

G. Ternary Base Calculator

Time Limit: 1 seconds
Authors: Syaafiq & Azrai

The binary numbering system consists of two numbers that powers up mighty supercomputers today. Two space aliens, Jebby and Val are intrigued with their discovery of Planet Earth's system and decided to come up with an improved system for their beloved Planet Kernam.

Planet Earth represents the binary numbers 0 and 1 for on and off respectively. The innovative space aliens want to have another number: 2 to represent another condition – idle! Please aid them to create a three-number (ternary) calculator as a pioneer for technologies in Planet Kernam.

Input

The first line contains *T* the number of test case(s).

The following lines contains *A, X, Y* where *X* and *Y* are numbers in base 3. *A* is an operator consisting either +, −, *, / that represents addition, subtraction, multiplication and division respectively.

Constraints

$1 \leq T \leq 100$
$0 \leq X, Y \leq 111201101$

Output

Z where Z is the result of *A* operation with *X* & *Y* operands. Print "NAN" if the operation is impossible.

Sample Input	Sample Output
2 + 1 2 − 2202211 2200111	10 2100

H. ASCIILATOR

Time Limit: 1 seconds
Authors: Shafiq & Sulaiman

Aida needs your help to finish her mathematics homework. She finds using normal calculator is boring so she wants a program that can convert binary to base 8, 10 and 16. She also wants to convert the binary to ASCII directly.

Input

First line contains an integer T for the test cases. Second line contains the binary value B.

Constraints

1<= T <=10
0010001 <= B <= 01111110

Output

Print the converted binary number starting from octal, decimal, hexadecimal and ASCII. Refer to example table below.

Decimal	Octal	Hex	Binary	Value
33	41	21	00100001	!
34	42	22	00100010	"

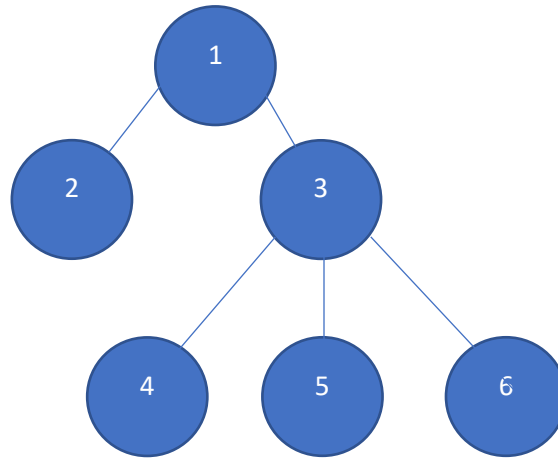| Sample Input	Sample Output
5 00100001 00110000 00111111 01011111 01111110	41 33 21 ! 60 48 30 0 77 63 3F ? 137 95 5F _ 176 126 7E ~

I. Tree Pair

Time Limit: 1 seconds
Authors: Shafiq & Sulaiman

Consider a pair of nodes of a and b is a Tree Pair if:

- Node a is the ancestor of node b
- Absolute of a-b ≤ K

Refer to following tree:

Example when K=3:

Pair	Abs(a-b)	Is Tree Pair
(1,2)	1	Y
(1,3)	2	Y
(1,4)	3	Y
(1,5)	4	N
(1,6)	5	N
(3,4)	1	Y
(3,5)	2	Y
(3,6)	3	Y

Number of Tree Pair = 6

Input

The first line contains two separated integer N, number of nodes and K, the absolute threshold value. Each of next n-1 lines contains two separated integers defining the parent, p[i] and its child, c[i] node.

Constraints

1 ≤ N ≤ 10^5
0 ≤ K ≤ N
1 ≤ p[i], c[i] ≤ N

Output

Single integer denoting the number of Tree Pair.

Sample Input	Sample Output
6 2 1 2 1 3 3 4 3 5 3 6	4

A. Au Revior!

Time Limit: 1 seconds
Author: Asyraf

Ali and his classmates are ending their university years soon. To say goodbye to each other, the batch has planned a big farewell party in which classmates, lecturers and friends sang and danced.

Ali remembered that n persons took part in that party. To make the party funnier, each person wore one hat among n kinds of weird hats numbered $1,2,\ldots n$. It is possible that several persons wore hats of the same kind. Some kinds of hats can remain unclaimed by anyone.

After the party, the i-th person said that there were a_i persons wearing a hat differing from his own.

It has been some days, so Ali forgot all about others' hats, but he is curious about that. Let b_i be the number of hat type the i-th person was wearing, Ali wants you to find any possible $b_1,b_2,\ldots,b_n$ that doesn't contradict with any person's statement. Because some persons might have a poor memory, there could be no solution at all.

Input

The first line contains a single integer n ($1\leq n\leq 105$), the number of persons in the party.

The second line contains n integers $a_1,a_2,\ldots,a_n$ ($0\leq a_i\leq n-1$), the statements of people.

Output
If there is no solution, print a single line "Impossible". Otherwise, print "Possible" and then n integers $b_1,b_2,\ldots,b_n$ ($1\leq b_i\leq n$). If there are multiple answers, print any of them

Sample Input	Sample Output
3 0 0 0	`Possible` 1 1 1
5 3 3 2 2 2	`Possible` 1 1 2 2 2
4 0 1 2 3	`Impossible`

GOODLUCK TO ALL PARTICIPANTS!

SPECIAL THANKS TO ALUMNI THAT CONTRIBUTED TO QUESTIONS. COULD NOT HAVE DONE IT WITHOUT YOU!