A Collatz

Problem

In the process to solve the *Collatz conjecture*, better known as the $3n + 1$ *problem*, Carl created a physical model with wood and ropes. A wooden bar contains a hole for every natural number from 1 to infinity from left to right. For every even number m there is a rope connecting the mth hole with hole $\frac{m}{2}$. For every odd number n there is a rope connecting the nth hole with hole $3n + 1$.

For an important conference where Carl plans to elaborate on his results, he wants to bring his structure, but it is too large to fit in his bag. So he decided to saw off the part of the bar containing the first N holes only. How many ropes will he need to cut?

Input

The first line of the input contains a single number: the number of test cases to follow. Each test case has the following format:

- One line with an integer N, satisfying $0 \leq N \leq 10^9$.

Output

For every test case in the input, the output should contain a single number, on a single line: the number of ropes that need to be cut.

Example

Input	Output
3	10
12	200
240	3000
3600	

Problem B Election of Evil

Dylan is a corrupt politician trying to steal an election. He has already used a mind-control technique to enslave some set U of government representatives. However, the representatives who will be choosing the winner of the election is a different set V. Dylan is hoping that he does not need to use his mind-control device again, so he is wondering which representatives from V can be convinced to vote for him by representatives from U.

Luckily, representatives can be persuasive people. You have a list of pairs (A, B) of represenatives, which indicate that A can convice B to vote for Dylan. These can work in chains; for instance, if Dylan has mind-controlled A, A can convince B, and B can convince C, then A can effectively convince C as well.

Input

The first line contains a single integer T ($1 \leq T \leq 10$), the number of test cases. The first line of each test case contains three space-separated integers, u, v, and m ($1 \leq u, v, m \leq 10{,}000$). The second line contains a space-separated list of the u names of representatives in U. The third line contains a space-separated list of the v names of representatives from V. Each of the next m lines contains a pair of the form `A B`, where `A` and `B` are names of two representatives such that `A` can convince `B` to vote for Dylan. Names are strings of length between 1 and 10 that only consists of lowercase letters (`a` to `z`).

Output

For each test case, output a space-separated list of the names of representatives from T who can be convinced to vote for Dylan via a chain from S, in alphabetical order.

Sample Input	Sample Output
2 1 1 1 alice bob alice bob 5 5 5 adam bob joe jill peter rob peter nicole eve saul harry ron eve adam joe chris jill jack jack saul	bob peter saul

Explanation

In the second test case, Jill can convince Saul via Jack, and Peter was already mind-controlled.

Problem C Square Root

Within the Jupiter project *H&H* developers should perform a lot of mathematical calculations. One of the most difficult tasks is to calcuate the value of square root of natural number with very high precision. You promised to help *H&H* programmers in this challenging task.

You are given two natural numbers N and K ($2 \le N \le 1600$, $1 \le K \le 15000$). Your task is to find $\sqrt{N}$ with K digits after decimal points.

Input

The first line of the input contains numbers N and K.

Output

Write to the output the square root of N with K digits after decimal point. No round-up is necessary, all digits should be precise.

Example

standard input	standard output
`2 10`	`1.4142135623`

Problem D Painting the natural numbers

The *H&H* company currently develops AI (artificial intelligence) for the game. The goal of the game is to paint all the natural numbers from 1 to N in 10 colors so that if the numbers a and b (a and b are not necessarily different) are one color, then $a + b$ has to be another color. Help *H&H*.

Input

The input consists of the only integer N ($1 \leq N \leq 25000$).

Output

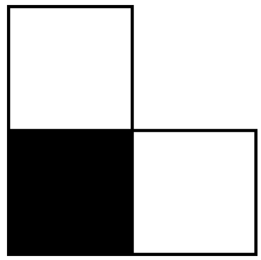
Output N numerals from 0 to 9 (each numeral indicates the color of the current number). If solutions does not exist, write N zeros to the output.

Example

standard input	standard output
10	0102010301

E Piece it together

Tom has developed a special kind of puzzle: it involves a whole bunch of identical puzzle pieces. The pieces have the shape of three adjoint squares in an L-shape. The corner square is black, the two adjacent squares are white.



A puzzle piece

The puzzler is given a pattern of black and white squares in a rectangular grid. The challenge is to create that pattern using these pieces. The pieces can be rotated, but must not overlap.

Tom has already designed a few nice patterns, but he needs to find out if they can be constructed with the pieces at all. Rather than trying to test this for each pattern by hand, he wants to write a computer program to determine this for him. Can you help him?

Input

On the first line a positive integer: the number of test cases, at most 100. After that per test case:

- one line with two integers n and m ($1 \leq n, m \leq 500$): the height and width of the grid containing the pattern, respectively.
- n lines, each containing m characters, denoting the grid. Each character is '`B`', '`W`', or '`.`', indicating a black, white or empty square respectively.

The grid contains at least one black or white square.

Output

Per test case:

- one line with either "`YES`" or "`NO`", indicating whether or not it is possible to construct the pattern with the puzzle pieces. You may assume that there is an infinite supply of pieces.

Sample in- and output

Input	Output
2 3 4 BWW. WWBW ..WB 3 3 W.. BW. WBW	YES NO

Problem F Sympathetic Tables

Let's call table $N \times M$ consisting of 0-s and 1-s *sympathetic* if and only if each square 2×2 of this table contains at least one 0 and at least one 1.

You are given two *sympathetic* tables A and B. You task is to answer to the question — is it possible to get the table B from the table A if in one step you are able to change the value of one element of the table (change 0 to 1 or 1 to 0). All intermediate tables must be *sympathetic*. The number of the steps in your solution must not exceed $7 \cdot M \cdot N$.

Input

The first line contains two integers N and M ($1 \leq N, M \leq 1000$).

Following N lines contain the descriptions of the table A (M numbers in each line separate by a spaces). Following N lines contain the descriptions of the table B in the same format.

Output

If it is not possible to get the table B from the table A with given restrictions print the number `-1`.

In the other case the first line of output must contains single integer K — the number of steps. Following K lines must contain the descriptions of steps — one step per line. Each step described by coordinates (i, j) of element which must be changed, where i is the number of row ($1 \leq i \leq N$) and j is the number of column ($1 \leq j \leq M$). Numbers in lines must be separated by a space.

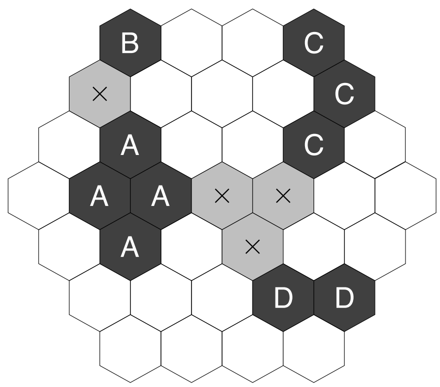
Examples

standard input	standard output
2 2 0 0 1 0 0 1 0 0	2 1 2 2 1

G Hexagonal Parcels

A civil engineer that has recently graduated from the Czech Technical University encountered an interesting problem and asked us for a help. The problem is more of economical than engineering nature. The engineer needs to connect several buildings with an infrastructure. Unfortunately, the investor is not the owner of all the land between these places. Therefore, some properties have to be bought first.

The land is divided into a regular "grid" of hexagonal parcels, each of them forms an independent unit and has the same value. Some of the parcels belong to the investor. These parcels form four connected areas, each containing one building to be connected with the others. Your task is to find the minimal number of parcels that must be acquired to connect the four given areas.



The whole land also has a hexagonal shape with six sides, each consisting of exactly H parcels. The above picture shows a land with $H = 4$, parcels with letters represent the four areas to be connected. In this case, it is necessary to buy four additional parcels. One of the possible solutions is marked by crosses.

Input Specification

The input contains several scenarios. Each scenario begins with an integer number H, which specifies the size of the land, $2 \leq H \leq 20$. Then there are $2.H - 1$ lines representing individual "rows" of the land (always oriented as in the picture). The lines contain one non-space character for each parcel. It means the first line will contain H characters, the second line $H + 1$, and so on. The longest line will be the middle one, with $2.H - 1$ characters. Then the "length" descends and the last line contains H parcels, again.

The character representing a parcel will be either a dot ("`.`") for the land that is not owned by the investor, or one of the uppercase letters "`A`", "`B`", "`C`", or "`D`". The areas of parcels occupied by the same letter will always be connected. It means that between any two parcels in the same area, there exists a path leading only through that area.

Beside the characters representing parcels, the lines may contain any number of spaces at any positions to improve "human readability" of the input. There is always at least one space between two letters (or the dots). After the land description, there will be one empty line and then the next scenario begins. The last scenario is followed by a line containing zero.

Output Specification

For each scenario, output one line with the sentence "`You have to buy` P `parcels.`", where P is the minimal number of parcels that must be acquired to make all four areas connected together.

Areas are considered *connected*, if it is possible to find a path between them that leads only through parcels that have been bought.

Sample Input

```
4
    B . . C
   . . . . C
  . A . . C .
 . A A . . . .
  . A . . . .
   . . . D D
    . . . .

0
```

Output for Sample Input

```
You have to buy 4 parcels.
```