A. Distinct Alphabets

Problem Description

We are all familiar with alpha numeric keypad that was used for messaging in earlier days. Given sequence of numbers 2-9 (both inclusive), find out the number of distinct alphabets that can be formed.

The rules of interpreting keypad strokes are as follows

1) Let''s understand with example. 25 can mean AJ but it can also mean pressing *button 5* two times. In that case it becomes K. See Examples section for better understanding.

2) Maximum number of distinct alphabets that can be formed cannot exceed 26

3) Alphanumeric keyboard used is as follows

· key 2 has letters "A B C"

· key 3 has letters "D E F"

· key 4 has letters "G H I"

· key 5 has letters "J K L"

· key 6 has letters "M N O"

· key 7 has letters "P Q R S"

· key 8 has letters "T U V"

· key 9 has letters "W X Y Z"

4) Input does not contain either 1 or 0 because no keypad buttons are associated with these numbers.

Constraints

1 <= Length of Input Literals <= 40

Input Format

Single Line contains a number with literals [2-9]

Output

Number of distinct alphabets after factoring all possible interpretations of the input

Explanation

Example 1

Input

253

Output

5

Explanation

It can be interpreted as AJD, KD , AE, thus distinct alphabets formed- A , J , D ,K , E = **5** distinct alphabets.
Example 2

Input

294

Output

5

B. Election in DisneyLand

Problem Description

Disney Land had an election on 1st April, 2018. Disney Land is divided into different constituencies.

Different parties who fought in the Election are as follows:-

Party 1 : AAA

Party 2 : BBB

Party 3 : Others

Disney Land is rolling out a new political process. Under this process, Disney Land will be divided into N * M equal parts called constituencies. These constituencies will then have to be aggregated into Political seats. The winner of the maximum number of seats will be the winner of the elections and will come to power in Disney Land.

The Aggregation process will involve distributing N*M constituencies into K Seats such that

Number of constituencies that are a part of a Electoral Seat is maximum i.e. of size B*B

No constituency is left out

There is no overlap of constituencies across Seats

Distribution of constituencies in Seats is equal

The party which wins maximum constituencies in a given Seat wins that Seat. Winner of maximum Seats wins the election.

For representational purpose, N*M constituencies of Disney Land are represented as a matrix. The winning political party in that constituency is represented with number as follows

Party AAA -> 1

Party BBB -> 2

Others -> 3

Given the matrix, find B*B different constituencies in the Disney Land (B < N, M). Find B in such a way that, B is maximum.

Unfortunate reality of Elections in this day and age is, Horse Trading. Disney Land is no different. After the election, some party may bribe some other party to surrender a particular constituency to win that seat.

Your task is to find which party won the Election after due process, including Horse-trading. If no party has a majority, then print "**No Majority**".

Constraints

Both N and M are even numbers

2<=N , M <=10

1<=seats <= 10

1<= H <= 10

Input Format

First Line indicates the Row (N) and Column (M) of the total number of constituencies in Disney Land.

Next N lines contain the data about which party has won which constituency

Next Line (After the N Lines of Seats) contains number of Horse-trades (H) that took place during the elections.

Next B Lines contains a data tuple <X, Y, Z> where

X & Y are the row & column of the seat where bribe took place, and

Z is the Party who initiated the horse trading.

Output

First Line should contain the party who has the majority before horse-trading and the number of seats of that party, separated by a colon (:) or **No Majority**
Second Line should contain the party who has majority after horse-trading and the number of Seats of that party, separated by a colon (:) or **No Majority**

Explanation

Example 1

Input

4 4

1 1 2 2

2 3 2 3

1 1 3 3

2 1 3 3

1

1 1 2

Output

Initial Majority Party:Seats = AAA:2

Party Won Party:Seats = BBB:2

Explanation

From the input having 4*4 matrix; wherein N = 4 and M = 4, it is divided into 4 equal constituency of 2*2 matrix each.

First Seat:-

1 1

2 3

Second Seat:-

2 2

2 3

Third Seat:-

1 1

2 1

Fourth Seat:-

3 3

3 3

The Party who won the First Seat = AAA

The Party who won the Second Seat = BBB

The Party who won the Third Seat = AAA

The Party who won the Fourth Seat = Others

From the Seat wins, it is clear that the Party who has the initial majority = AAA

Now, the constituency present in Row = 1 and Column = 1 is bribed by Party BBB.

Hence, that Seat (First Seat) after the Bribing process will be:-

2 1

2 3

Hence, the Party who won the First Seat = BBB

Thus, after horse-trading activities complete, the Party who finally won the Election = BBB

C. Jurrasic Park

Problem Description

Smilodon is a ferocious animal which used to live during the Pleistocene epoch (2.5 mya–10,000 years ago). Scientists successfully created few smilodons in an experimental DNA research. A park is established and those smilodons are kept in a cage for visitors.

This park consists of Grasslands(G), Mountains(M) and Waterbodies(W) and it has three gates (situated in grasslands only).Below is a sample layout.

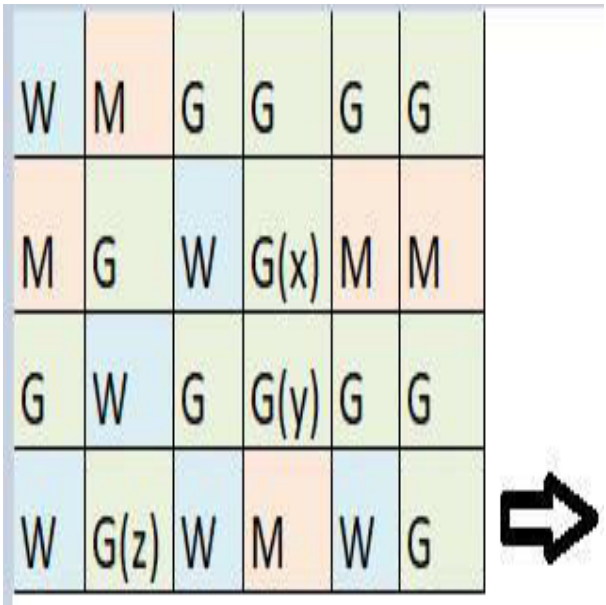
W	M	G	G	G	G
M	G	W	G	M	M
G	G	G	G	G	G
W	G	G	M	W	G

Before opening the park, club authority decides to calculate Safety index of the park. The procedure of the calculation is described below. Please help them to calculate.

Safety Index calculation

Assume a person stands on grassland(x) and a Smilodon escapes from the cage situated on grassland(y). If the person can escape from any of those three gates before the Smilodon able to catch him, then the grassland(x) is called safe else it is unsafe. A person and a Smilodon both takes 1 second to move from one area to another adjacent area(top, bottom, left or right) but a person can move only over grasslands though Smilodon can move over grasslands and mountains.

If any grassland is unreachable for Smilodon(maybe it is unreachable for any person also), to increase safe index value Club Authority use to mark those grasslands as safe land. Explained below



For the above layout, there is only one gate at (4,6)

Y is the position of Smilodon’s cage

X is not safe area

Z is a safe area as is it not possible for smilodon to reach z

Safety index=(total grassland areas which are safe*100)/total grassland area

Constraints

3? R,C ? 10^3

Gates are situated on grasslands only and at the edge of the park

The cage is also situated in grassland only

The position of the cage and the position of three gates are different

Input Format

The first line of the input contains two space-separated integers R and C, denoting the size of the park (R*C)

The second line contains eight space-separated integers where

First two integers represent the position of the first gate

3rd and 4th integers represent the position of second gate

5th and 6th integers represent the position of third gate respectively

The last two integers represent the position of the cage

Next R lines, each contains space separated C number of characters. These R lines represent the park layout.

Output

Safety Index accurate up to two decimal places using Half-up Rounding method

Explanation

Example 1

Input

4 4

1 1 2 1 3 1 1 3

G G G G

G W W M

G G W W

M G M M

Output

75.00

Explanation

G	G	G	G
G	W	W	M
G	G	W	W
M	G	M	M
	Mountains	4	
	Gates- Safe Areas	3	
	Other Safe Areas	3	
	Waters	4	
	Cage Pos.-unsafe	1	
	Other unsafe areas	1	

Safety Index= (6*100)/8

Example 2

Input

4 6

1 6 3 6 4 6 3 4

W M G G G G

M G W G M M

G W G G G G

W G W M W G

Output

69.23

D. Bank Compare

Problem Description

There are two banks; Bank A and Bank B. Their interest rates vary. You have received offers from both bank in terms of annual rate of interest, tenure and variations of rate of interest over the entire tenure.

You have to choose the offer which costs you least interest and reject the other.

Do the computation and make a wise choice.

The loan repayment happens at a monthly frequency and Equated Monthly Installment (EMI) is calculated using the formula given below :

EMI = loanAmount * monthlyInterestRate /

(1 - 1 / (1 + monthlyInterestRate)^(numberOfYears * 12))

Constraints

1 <= P <= 1000000

1 <=T <= 50

1<= N1 <= 30

1<= N2 <= 30

Input Format

First line : P – principal (Loan Amount)

Second line : T – Total Tenure (in years).

Third Line : N1 is number of slabs of interest rates for a given period by Bank A. First slab starts from first year and second slab starts from end of first slab and so on.

Next N1 line will contain the interest rate and their period.

After N1 lines we will receive N2 viz. the number of slabs offered by second bank.

Next N2 lines are number of slabs of interest rates for a given period by Bank B. First slab starts from first year and second slab starts from end of first slab and so on.

The period and rate will be delimited by single white space.

Output

Your decision – either Bank A or Bank B.

Explanation

Example 1

Input

10000

20

3

5 9.5

10 9.6

5 8.5

3

10 6.9

5 8.5

5 7.9

Output

Bank B

Example 2

Input

500000

26

3

13 9.5

3 6.9

10 5.6

3

14 8.5

6 7.4

6 9.6

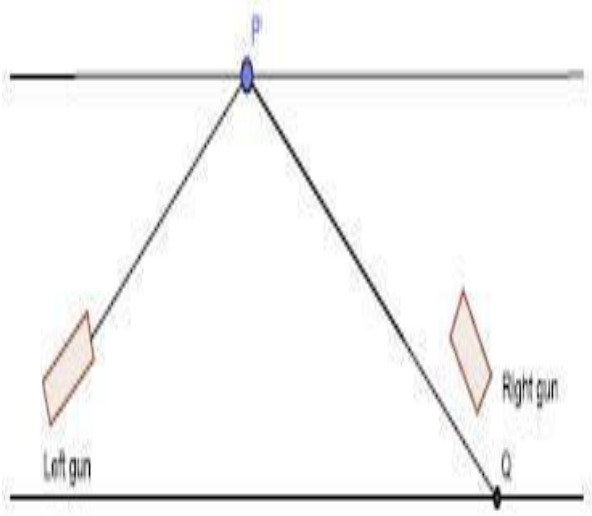
Output

Bank B

E. Colliding Cannons

Problem Description

We have seen in many mythological movies, the arrows shot, by the opponents collide midair and one devour the other.



You wanted to simulate a similar situation for the video game you are designing. In the game, the opponents are in a tunnel and have a gun each. They can shoot bullets in any direction (within limits). The roof and floor

of the tunnel are perfect surfaces and any object hitting them are bounced off according to the law of reflection (angle of incidence equals the angle of reflection), with unchanged speed. For simplicity, we can assume that the tunnel is a two dimensional horizontal strip. Of course, this being the mythological world, gravity does not exist, and the bullets travel in straight lines at constant spped until being reflected (or they collide).

The two guns are positioned at half the height (h) of the tunnel, at a distance D apart.

The two guns fire simultaneously. The trajectories of the bullets (if extended) will meet at a maximum of one point. They are said to collide if their trajectories meet, and the two bullets arrive at that point within 0.5 seconds of each other.

The shooting angle varies from -85 degrees to 85 degrees from the horizontal. For the left gun, the angles are measured anti-clockwise, and for the right gun they are measured clockwise. Hence, with a positive angle for both, the left gun shoots up and to the right, and the right gun shoots up and to the left.

Write a program to decide whether the bullets shot will collide or not. If they do, determine where will they collide. The coordinate axes for reference have origin at the midpoint of the line joining the guns, X axis along the line joining the guns. Hence, the left gun's coordinates are (-D/2,0) and the right gun's coordinates are (D/2,0). The equations for the top of the tunnel is y=h/2, and of the bottom of the tunnel is y=-h/2.

Constraints

-85<=LA,RA<=85

0<LS,RS<1000

0<h,D<10000

Input Format

The input has two lines.

The first line has two comma separated positive integers, h and D (the height of the tunnel and the distance between them). The unit of distance measurement is myth units.

The second line has four comma separated numbers (with up to two decimals each) giving LA, LS, RA and RS respectively, where LA, LS denote the angle (in degrees) and speed of firing (in myth units per second) of the left gun and RA, RS denote the angle (in degrees) and speed of firing (in myth units per second) of the right gun.

Output

If the two collide (the trajectories meet, and they arrive at the meeting point within 0.5 seconds of each other), the output is a comma separated string of the word Yes and the coordinates of the colliding point.

Yes,x,y

Here, x and y are the coordinates of the collision point, and each must be round to two decimal places

If they do not collide, the output is the word No.

No

Explanation

Example 1

Input

500,2000
30,90,40,70

Output

Yes,47.20,171.01

Explanation

The distance between the guns is 500 myth units, and the height of the tunnel is 2000 myth units. The angle of firing of the left gun is 30 degrees and the speed of the bullet from the let gun is 90 myth units per second. The angle of the right gun is 40 degrees, and the speed of the bullet from the right gun is 70 myth units per second.

The coordinates of the intersection point of the trajectories is (to two decimal places) (46.20,171.01). The time for the left bullet to reach this point is (to two places) 3.80 seconds, and for the right bullet (to two seconds) is 3.80 seconds. As this is within 0.5 seconds of each other, the collision is assumed to have taken place. Hence the output is Yes,46.20,171.01

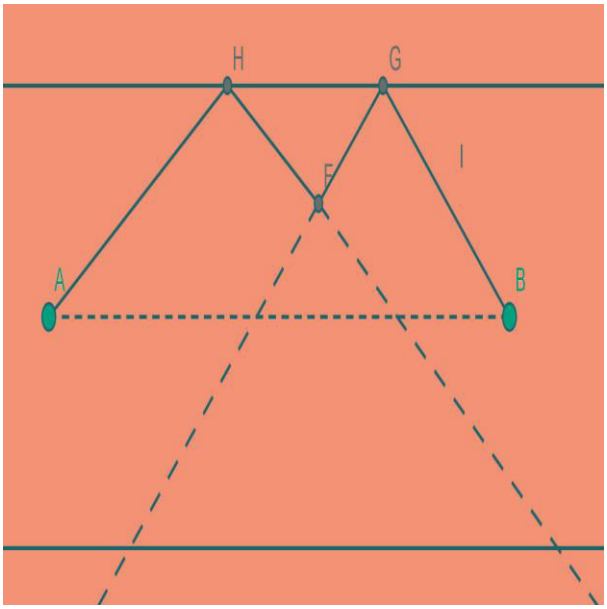
Example 2

Input

500,2000
80,70,85,70 Output
Yes,84.19,104.74

Explanation

The distance between the guns is 500 myth units and the height of the tunnel is 2000 myth units. The left gun angle is 80 degrees, and the left gun speed is 70 myth units per second. The right gun angle is 85 degrees and the speed is 70 myth units per second also.



The guns shoot, and reflect off the ceiling (at H and G respectively), and the trajectories meet at F. The coordinates of F are (84.19, 104.74). The time taken for the left bullet is 27.49 seconds, and the time for the second bullet is 27.17 seconds. As they arrive within 0.5 seconds of each other, this is considered a collision. Hence the output is Yes,84.19,104.74

Example 3

Input

500,2000
30,170,50,160

Output

No

Explanation

The two trajectories meet at (86.82,194.47), but the left bullet takes 2.29 seconds, and the right bullet takes 1.59 seconds. Hence, they do not pass within 0.5 seconds of each other, and there is no collision.

F. Integer Expressions

Problem Description

The fourth standard Mathematics teacher wanted to create some Aha moments of discovery in his students. He puts slips of paper into a box, each slip containing one positive integer between 1 and 10000. He asks each student to pick a slip of paper from the box and try to build that number using only symbols from the set { “1” “+” “x” “(“ “)”} using the least number of symbols. In the symbols, “+” represents addition, “x” represents multiplication, and the normal precedence rules apply (a multiplication is done before addition unless brackets are used). The symbol “1” may be used one or more times to represent the numbers 1, 11, 111 or 1111. Of course the formulae must be valid arithmetical expressions, and unbalance brackets are not allowed.

For example, 24 = 11+11+1+1 and we have used only 9 symbols. A longer expression is 24 = (1+1) x (11+1), containing 12 symbols.

As you are much smarter than fourth standard students, we will give you more than one positive integers to express using these.

Constraints

3<N<15

The integers to be represented will be less than 10000.

Input Format

The first line will contain the number of expressions, N, that are needed to be discovered.

The next N lines will have a positive integer each, which need to be represented in expressions of minimal length using the five symbols.

Output

The output will have N lines giving the length of the minimal expression for the corresponding number in the input.

Explanation

Example 1

Input

3

24

12

33

Output

9

4
8

Explanation

There are three input numbers (N=3), and they are 24, 12 and 33. The representation for 24 takes 9 symbols “1+1+11+11” , 12 takes 4 symbols “11+1” and 33 takes 8 symbols “11+11+11”. The out is 9, 4 and 8 in three lines.

Example 2

Input

5
121
1331
122
222
333
Output
5
8
6
7

11

Explanation

There are 5 inputs, 121, 1331, 122, 222, 333. The corresponding minimal expressions are “11x11”, “11x11x11”, “111+11”,”111+111”, “111x(1+1+1)”. With lengths 5,8,6,7,11 symbols respectively. Note that there may be multiple representations of the same number with the same length, even apart from the trivial case of changing the order of the symbols (111+11 or 11+111). For example 333=111x(1+1+1) =111+111+111, and both are the same length.