Georgia Tech Code Challenge

Saturday, March 31 2012

Rules and Guidelines

1. There are **fourteen** problems to be completed in **four hours**
2. The input is from standard in and the output is to standard out
3. The allowed programming languages are C, C++, Java and Python
4. Name files (and classes in Java) as A, B, C, .., M
5. Maximum number of test cases (T) for all problems is 100
6. Time limit for each problem is 10 seconds (on the judging system)
7. Judges' decisions are to be considered final. No cheating will be tolerated

File	Problem Name	Difficulty
A	Card Shark	2
B	Smart Man Competition	1
C	A Little Weekend Math	3
D	WiFi Nation	8
E	Lucky Lotto Numbers	2
F	Slide Show	3
G	Party	1
H	Staircase	2
I	Word Search	4
J	Adventure Land	6
K	Numbers	6
L	Pitcher	5
M	The God Particle	7
N	Winner Take All	10

A: Card Shark

Difficulty: 2

Daniel has been playing poker for a while now, and has decided that a flush is his favorite type of hand. In fact, he's so obssessed with drawing cards of the same suit he has hired you to write a program to calculate the probability of drawing k cards from a perfectly shuffled deck and them all being spades.

Input

The first line contains a single integer T specifying the number of test cases. T lines follow containing 5 space separated integers, k the number of cards to draw, s the number of spades in the deck, c the number of clubs in the deck, h the number of hearts in the deck, and d the number of diamonds in the deck. The deck is perfectly shuffled (meaning every configuration of cards has the same probability of occuring).

$$1 \leq k, s, c, h, d \leq 1000$$

Output

For each test case output a line with the probability all k cards drawn are spades **rounded** to 4 decimal places. You must always print exactly 4 decimal places.

Samples

Input	Output
4	0.0005
5 13 13 13 13	0.0000
14 13 13 13 13	0.0179
5 5 1 1 1	0.1586
7 1000 100 100 100	

B: Smart Man Competition

Difficulty: 1

Paul has been entered into a competition where he must use his intelligence to compete with other contestants. There will be many contestants and many competitions. After each competition the winner leaves and does not compete again in the next competitions. The person with the highest IQ will always win. If multiple people have the same IQ each one has an equal chance of winning. Paul wants to know the minimum number of competitions he must wait for until he has a chance to win.

Input

The first line contains a single integer T specifying the number of test cases that follow. Each test case starts with Paul's IQ, q, on its own line. The next line starts with an integer P specifying the number of people initially in the competition. P space separated integers follow on the same line specifying each person's IQ.

$0 \leq q, p \leq 200$ where p is the value of a person's IQ

$1 \leq P \leq 1000$

Output

For each test case output a line with the minimum number of competitions Paul must wait before he can win.

Samples

Input	Output
3 120 5 100 110 160 150 140 80 3 80 80 90 160 7 161 161 161 161 161 162 161	3 1 7

C: A Little Weekend Math

Difficulty: 3

Finally a weekend, a long-awaited time to relax! However, it isn't a relaxing weekend for everyone, your little sister keeps bothering you with her upcoming math test. You are happy to help her, but when she asks you to check one of her answers for the hundredth time you get bored.

You decide to write a simple computer program to help your sister check her answers.

Input

The first line contains a single integer T specifying the number of test cases. T lines follow, each containing a single equation. Each equation will be written as "X+p=q" or "p+X=q" or "X-p=q" or "p-X=q", where "X" is the uppercase letter X.

$$-1000 \leq p, q \leq 1000$$

Output

For each equation print a line with the value of "X" that satisfies the equation.

Samples

Input	Output
4 +X+5=7 3-X=9 -2-X=-10 X+0=0	2 -6 8 0

D: WiFi Nation

Difficulty: 8

Niue is an island country in the South Pacific Ocean. Niue is a very small, yet very happy place. In 2003, Niue became the world's first "WiFi nation", in which free wireless internet access is provided throughout the country.

Now, the king of the neighboring country wants to be known as a "king who brought internet to the country" so that people would praise him. However, he is careful with his money and wants to buy the cheapest routers possible. He already ordered the server to be built at the capital city, and now he wants to place WiFi routers at every important location so that all locations are connected to the server, either directly or through other routers. All the routers are identical, and they cover everything within some circular area with radius R.

You have been hired to help find the minimal possible range that routers need to cover, such that all of them are still connected to the server at the capital. Two routers are connected if they are within distance R from each other.

Input

The first line contains a single integer T specifying the number of test cases. Each test case provides information about the country and the locations where internet must be provided. Each test case starts with a single integer N on its own line, specifying the number of important points that follow. Each of the N important points occur on a single line and consists of a pair of space separated integers, x y. Where x represents the x-coordinate of the important point, and y represents the y-coordinate of the important point. You may assume that no two important points have the exact same coordinates, and that no important point has the same coordinates as the capital. The capital of the country is always at the origin $(0, 0)$.

$1 \leq N \leq 100$

$-1000 \leq x, y \leq 1000$

Output

For every test case print on a single line the smallest possible radius of the WiFi routers rounded to 4 decimal places. You must always print exactly 4 decimal places.

Samples

Input	Output
2 3 -1 -1 1 1 2 2 4 0 1 1 0 -1 0 0 -1	1.4142 1.0000

E: Lucky Lotto Numbers

Difficulty: 2

Suddenly you realized that you wanted to be rich. You want to be rich now!

Serious times require serious actions! Obviously you don't believe all the scams on the internet about quick and easy money. So you decide to win a lottery! You use your psychic power in order to predict the winning lottery numbers.

You sit in a dark, quiet room, you empty your mind, and you concentrate on the balls coming out of the machine. However instead of the numbers you get some weird feelings. One tells you that you have to select five distinct integers such that no two of them add up to any other number you've chosen. Another tells you that the product of any two numbers you chose must not be divisible by X.

Input

The first line contains a single integer, T, specifying the number of test cases. Each of the following T lines contains a single integer X.

$$2 \leq X \leq 30$$

Output

For each test case output 5 integers in the range 1 to 30 (inclusive) satisfying the above conditions. If there are multiple possible answers output the one where the first number is as small as possible, if there is still a tie output the one where the second number is as small as possible, etc.

Samples

Input	Output
2 2 3	1 3 5 7 9 1 2 4 7 10

F: Slide Show

Difficulty: 3

Given a sequence of photos for a slide show and a pattern in which the sequence will be played through, tell us which photo will be showing on the i-th slide.

The four different patterns are:

1. Normal
2. Ping
3. Reverse
4. Reverse-Ping

Examples of the patterns given the photos in the order A, B, C, D:

Normal:	A, B, C, D, A, B, C, D, A, B, C, D...
Ping:	A, B, C, D, C, B, A, B, C, D, C, B...
Reverse:	D, C, B, A, D, C, B, A, D, C, B, A...
Reverse-Ping:	D, C, B, A, B, C, D, C, B, A, B, C...

Input

The first line contains a single integer, T, specifying the number of test cases. Each test case is given on 4 consecutive lines. The first line contains a single integer $1 \leq N \leq 100$ specifying the number of photos. The next line contains the sequence of photos names separated by space. Every photo has a unique name consisting of at most 20 capital letters (A-Z). The third line contains a single integer $1 \leq K \leq 100$ specifying the number of queries for the sequence. The last line contains K space separated integers, the queries themselves. Each query is a positive integer less than 1,000,000,000.

Output

For each query q in the input print a line containing the 4 space separated names of photos that will appear on the q^{th} slide of each of the 4 patterns, Normal, Ping, Reverse, Reverse-Ping.

Samples

Input	Output
2 4 A B C D 5 1 3 5 7 9 2 FIRST SECOND 2 1 2	A A D D C C B B A C D B C A B D A C D B FIRST FIRST SECOND SECOND SECOND SECOND FIRST FIRST

G: Party

Difficulty: 1

In a party held by Georgia Tech, there are several people attending. Each male guest will dance with a female guest. Unfortunately, it turns out the total number of male guests may not equal to the number of female guests. Therefore, we want you to find out the maximal number of pairs of guests that can dance at a single time.

Input

The first line contains a single integer, T, representing the number of test cases. For each test case the input contains two lines. The first line is an integer $1 \leq n \leq 100$, which represents the total number of people going to the party. The second line is a string of length n, each character is either 0 or 1 representing the guest is either male or female respectively.

Output

For each test case print a single line with the maximal number of pairs of people that can dance at a single time.

Samples

Input	Output
2 5 10110 2 01	2 1

H: Staircase

Difficulty: 2

Ramya is climbing a super long staircase, which is composed of n stairs. Unlike regular staircases, each stair in this staircase has a different height. The heights are $h_1, h_2, h_3 \ldots h_n$. Each time Ramya takes a step, she can at most lift her feet a height of H. Suppose Ramya is at the i^{th} stair, she can step to the j^{th} stair if $h_{i+1} + h_{i+2} + \cdots + h_j \leq H$. Ramya wants to move from the ground to the n^{th} stair, that is the top of the staircase, as quickly as possible. She wants to know the minimal number of steps she must make to end up on stair n.

Input

The first line contains a single integer, T, representing the number of test cases. For each test case the first line contains two positive integers: $1 \leq n \leq 1000$ and $1 \leq H \leq 1000$. The second line contains n integers: $h_1, h_2, h_3, \ldots, h_n$, where each $1 \leq h_i \leq H$.

Output

For each test case print a single line with an integer which represents the minimum number of steps Ramya has to make.

Samples

Input	Output
2 5 6 1 2 4 4 5 5 10 1 2 3 4 1	4 2

I: Word Search

Difficulty: 4

In this problem you must write a program to determine if a particular word is within a particular word search. In this problem we will only search for words horizontally, vertically, and diagonally. The three directions should be left-to-right and top-to-bottom only.

Input

The first line contains a single integer, T, specifying the number of test cases that follow. Each test case consists of a line containing a single word, w, composed of only lowercase letters (a-z), the next line contains two space separated integers $1 \leq n, m \leq 500$, n lines follow containing strings of lowercase letters (a-z) of length m, these lines describe the word search, W, you will be searching.

Output

For each test case output "yes" (quotes for clarity) on its own line if you find w in W according to the rules specified in the description or "no" (quotes for clarity) on its own line if w is not found in W.

Samples

Input	Output
3 cat 3 3 abc aba abt juice 5 7 djuiclp gtuisth ebeistc ollecge everrer dog 3 3 god ood ddd	yes yes no

J: Adventure Land

Difficulty: 6

Artur is traveling in adventure land. Adventure land is a magical place where the floor is made up of square, golden tiles. On each tile there is a pile of gold coins. Artur has been wandering for a while and is at a particular point in this world. Artur is getting tired and wants to leave, however on his way out he wants to collect as many gold coins as possible.

In this world there is a special tile that will teleport you out (this tile may also have coins on it). Determine the maximum number of coins that Artur can collect if he makes his way to this tile in the shortest number of steps possible.

In this world you may only move to tiles directly Above, Below, Left or Right of the current tile. You may not move diagonally.

Input

The first line contains a single integer, T, representing the number of test cases. Each test case starts with a line containing 6 space separated integers: n m a b c d. There are n rows and m columns in the world described by this line. Artur is at position (a, b) where a point is (row, column). The point (0, 0) is the location of the top left tile – this is the first integer seen on the first line describing the world. Artur needs to reach the exit which is located at (c, d). Next n lines follow, each containing m space separated integers. This describes the number of gold coins on each tile in this world, there will be a non-negative number of coins on each tile less than or equal to 50.

$1 \leq n, m \leq 100$

$0 \leq a \leq c < n$

$0 \leq b \leq d < m$

Output

For each test case output a line containing the maximum number of gold coins that Artur can collect while reaching the exit as soon as possible.

Samples

Input	Output
1 1 4 4 0 0 3 3 1 2 3 4 3 4 4 5 3 8 10 8 4 5 6 7	41

The best route is 1-3-4-8-10-8-7

K: Numbers

Difficulty: 6

Brandon is playing with numbers. Brandon likes big numbers, but he wants to challenge himself on how he comes up with them. He starts with an integer N and he breaks it up into the sum of other positive integers, he then takes these smaller numbers and multiplies them all together. Brandon wants to maximize this product for a given N. He wants you to tell him the maximum product possible for a given integer N.

For example for the number 5, you can split it up into the sum of 3 and 2. Their product is equal to 6, and this is the maximum possible product for 5.

Input

The first line contains, T, representing the number of test cases. Each test case contains a single line containing an integer $1 \leq N \leq 50$.

Output

For each test case print a line containing an integer that represents the greatest product possible. The answer is guaranteed to be less than 100,000,000.

Samples

Input	Output
2	6
5	54
11	

L: Pitcher

Difficulty: 5

Alice is playing with some pitchers of water. When playing with the pitchers Alice has some rules. When pouring the contents of one pitcher into another, she must stop when the pitcher being poured into is full or the other pitcher is empty, and never before one of these conditions is satisfied.

Alice is playing with 3 pitchers with certain capacities. She's been playing with them for a while and they are at some initial configuration. Alice would like to know if it is possible through some sequence of moves if she can reach another configuration. You will be writing a program to determine if it is possible to reach her target configuration if she follows her rules.

Input

The first line contains, T, representing the number of test cases. For each test case: A line containing 9 space separated integers: $A, B, C, Q, R, S, X, Y, Z$. Pitcher One has capacity A and initially contains Q units of water, Pitcher Two has capacity B and initially contains R units of water, Pitcher Three has capacity C and initially contains S units of water. You should determine if it is possible to reach the configuration where Pitcher One contains X units of water, Pitcher Two contains Y units of water, and Pitcher Three contains Z units of water.

$1 \leq A, B, C, Q, R, S, X, Y, Z \leq 50$

$Q \leq A$

$R \leq B$

$S \leq C$

Output

For each test case print a single line containing "yes" (quotes for clarity) if it is possible to reach the configuration X, Y, Z or "no" (quotes for clarity) if it is not.

Samples

Input	Output
2 2 2 2 1 1 1 2 0 1 4 4 4 2 2 2 3 0 3	yes no

M: The God Particle

Difficulty: 7

LHC at CERN is running a lot of experiments trying to find the Higgs boson, yet none of the attempts have found anything yet. You proposed a promising new way of detecting the particle. The head scientists gave their consent for you to run your experiment.

After a few hours of running the experiment nothing happened! You know that particles were launched; they accelerate but never collide. Now you wonder if it is a fault in the practical setup or you overlooked some theoretical basis.

For simplicity, you will only consider 2D cases. Two particles will be given as circles on the plane with some velocity and you want to know if they will collide or not.

Input

The first line contains a single integer, T, specifying the number of test cases. Each test case describes two particles, each on a single line. A particle will be given as 5 non-negative integers: x, y, r, p, q, where x and y are the initial coordinates of the center of the circle; r is the circle's radius. (p, q) is a vector specifying the velocity. For example vector $(2, 0)$ means that the particle is moving strictly to the right at the speed of two units per second. You may assume that initially the circles do not intersect or touch each other. All the numbers in the input are integers and are less than or equal to 1000.

Note: Assume that the input will *not* contain cases where the two particles will collide 'tangentially' (that is, after collision, they will continue with the same velocity).

Output

For each test case output "yes" (quotes for clarity) on its own line if the particles colli e, or "no" (quotes for clarity) on its own line if the particles do not collide.

Samples

Input	Output
2 0 0 1 0 1 3 0 1 0 1 0 0 1 1 1 3 0 1 0 1	no yes

N: Winner Take All

Difficulty: 10

Zhongtian and Kyle are playing a game on a N x M grid. The grid consists of obstacles and empty spaces. Zhongtian starts the game by placing a coin on any available empty space on the grid. Then, Kyle moves the coin onto an adjacent empty space (left, right, up or down; diagonal moves are not allowed) that has not been visited previously. Then Zhongtian repeats the same process. Zhongtian and Kyle alternate turns until one of them cannot move the coin anymore, in which case the other player is declared the winner. Assuming both players play optimally, determine the winner of the game.

Input

The first line contains a single integer, T, representing the number of test cases. Each test case starts with a line containing 2 space separated integers: N and M. Each of the following N lines contains M characters ("#" for obstacles and "." for empty spaces) describing the grid.

$1 \leq N, M \leq 100$

Output

For each test case output "Zhongtian" (quotes for clarity) on its own line if Zhongtian is declared the winner or "Kyle" (quotes for clarity) on its own line if Kyle is declared the winner.

Samples

Input	Output
2 5 5 ##### ##.## #...# ##.## ##### 1 2 ..	Zhongtian Kyle