

Problem A. Alliances in Hogwarts

Input: Standard
Output: Standard
Author(s): Melissa Delgado - UFPS Colombia

These are hard times for Dumbledore's followers in Hogwarts. The Ministry of Magic is interfering at Hogwarts, and assigned Dolores Umbridge for this work. Some students oppose the the Ministry's rules and have established alliances as the Dumbledore's Army. Professor Umbridge wants to dissolve this alliances and punish all who break the rules and defy the Ministry, that's why she assigned to Draco and the Inquisitorial Squad a very special mission: determine which students belongs to the Dumbledore Army.

To achieve this mission the Inquisitorial Squad must observe the behaviour of the students and determine if they are allies(support the Ministry) or enemies(belong to the Dumbledore's Army). The Inquisitorial Squad can mark the relation between two students as friendship or enmity, according to their behaviour and following the next rules:

- Two students are allies if their loyalties are the same.
- Two students are enemies if they have different loyalties.
- A student is by definition ally of himself.
- Nobody is an enemy of himself.
- Both relations of friendship or enmity are mutual.
- "Friends of my friends are my friends too". If the student x is ally of student y and student y is ally with student z , then x is ally with z too.
- "The enemy of my enemy is my friend". If x is a enemy of z and z is an enemy of y , then x is a friend of y .
- "The enemy of a friend is my enemy too". If x is a friend of y and y is an enemy of z , then z is an enemy of x too.

Professor Umbridge is not so patient, so she will be asking questions to the Inquisitorial Squad while they do the mission, and they have to answer on the basis of their observations so far. You may assume that the at beginning of the mission don't exist friendship or enmity relationships between any two students.

Input

Input contains several test cases. Each test case begins with two integers n and q ($1 \leq n \leq 10000$, $1 \leq q \leq 100000$), the number of Hogwarts students and the number of operations made by the Inquisitorial Squad. Each of the q following lines contains 3 integers c , x and y ($0 \leq x, y < n$), where x and y are the number of the student and c is the code of the operation:

- $c = 1$ means that the Inquisitorial Squad mark the relationship of students x and y as friendship. This relationship will be saved only if it does not contradict with previously detected relationships.
- $c = 2$ means that the Inquisitorial Squad mark the relationship of students x and y as enmity. This relationship will be saved only if it does not contradict with previously detected relationships.
- $c = 3$ means that Umbridge ask the Inquisitorial Squad if students x and y are friends.

- $c = 4$ means that Umbridge ask the Inquisitorial Squad if students x and y are enemies.

Output

For every Umbridge's question print '1' meaning yes or '0' meaning no. For every time that the Inquisitorial Squad determine a relationship that contradicts previous knowledge print '-1'. Relationships that are accord the rules doesn't gives output. All the integers in the output must be separated by one line break.

Example

Input	Output
6 14	0
1 1 2	0
1 4 5	1
3 5 3	-1
4 4 5	1
3 1 2	0
2 2 3	1
1 1 3	0
4 1 3	1
1 3 5	
2 2 0	
4 3 0	
3 3 0	
3 1 5	
4 2 5	



Problem B. Vogons

Input: Standard
Output: Standard
Author(s): Gerson Lázaro - UFPS Colombia

We all know the Vogons: A race of detestable aliens of Vogosphere planet, very similar to slugs but with a couple of humanoid characteristics, corpulent and with green skin. We all know too that they are the more bureaucratic characters of the space, the third worst poets of the universe and finally we all know that they have been commissioned to destroy the earth in order to build an intergalactic road.

What is not so well known is that the Vogons had prepared their tools to extract all the gold from the earth while they can. However, their tool is anything but sophisticated and instead of collect the gold and then destroy the earth, does both things at the same time, destroying a lot of gold before being collected.

A gold mine can be represented as a rectangular grid, where each square has an amount of gold g . When a Vagon's ship lands over the mine does the following process:

- Select a square not destroyed.
- Extract all the gold from the selected square.
- Destroy the selected square.
- Destroy the upper and lower square without extract the gold.
- Destroy all the squares from the right and left column of the selected square without extract the gold.

Once the square is destroyed, there is no gold anymore in the square. Vagon's will keep repeating this process over and over again until all the mine has been destroyed.

What is the maximum amount of gold they can extract?

Input

Input contains several test cases. Each test contains two integers n and m ($1 \leq n, m \leq 300$), the number of rows and columns that conforms the mine. Following there are n lines with m integers $g_{i,j}$ ($1 \leq g_{i,j} \leq 2000$) representing the amount of gold in each square of the mine.

Output

Print a single line per test case, the maximum amount of gold that Vogons can extract.

Example

Input	Output
4 4 10 1 1 10 1 5 4 1 1 4 5 1 10 1 1 10	40

Problem C. Royale With Cheese

Input: Standard
Output: Standard
Author(s): Daniel Vega Santos - UFPS Colombia

Vincent Vega and his friend/partner Jules Winnfield are hitting the road in search of a person to “make a visit”. Yes, they are both hitman, and there’s a particular conversation going on right now, pay attention to the details:

Vincent: You know what the funniest thing about Europe is?

Jules: What?

Vincent: It’s the little differences. I mean they got the same things over there that they got here ... but it’s just there, it’s a little different.

Jules: Example?

Vincent: You can walk into a movie theater in Amsterdam and buy a beer and i don’t mean just like in an old paper cup, i’m talkin’ about a glass of beer. In Paris, you can buy a beer in McDonald’s.

Vincent: You know what they call a ... a ... a Quarter Pounder with Cheese in Paris?

Jules: They don’t call it a Quarter Pounder with cheese?

Vincent: No man, they got the metric system. They wouldn’t know what a Quarter Pounder is.

Jules: Then what do they call it?

Vincent: They call it a Royale with cheese.

Jules: A Royale with cheese. What do they call a Big Mac?

Vincent: Well, a Big Mac’s a Big Mac, but they call it le Big-Mac.

Jules: Le Big-Mac. Ha ha ha ha. What do they call a Whopper?

Vincent: Well, a Whopper here it’s just a Whopper there. Some things never change ...

Interesting last words of Mr. Vincent Vega, because i went to Amsterdam last summer and there is a peculiarity with the numbering system of houses. The funny thing about this system is that the police have to decode the house’s numbering system when they give information back to the police station. Let me give you an example:

A house identified by the following id “abbchocx”, is identified by the police under the id = 15534239. Each character that has not appeared previously in the sequence, takes an ascending numeric value, starting in 1: $a = 1$, $b = 2$, $c = 3$, $h = 4$, $o = 5$, $x = 6$. When a character has taken a numeric value, every repetition of the character will have the same value. One last thing to take on count is that the police love to exchange some digits: In the resultant id every 2 will become a 5, and every 6 will become a 9 (in the same way, every 5 becomes a 2, and every 9 becomes a 6).

It’s weird, i know. It’s even weirder that from a trip i took last summer to Amsterdam, i have knowledge of all that.

I guess the funny thing about Europe are in fact, “the little differences”.

Input

The input consists of multiple test cases. Each test case contains a string S with length n ($1 \leq n \leq 10^5$) identifying a house in the weird numbering system implemented in Amsterdam. The string S is formed only with 26 lowercase letters ($a \rightarrow z$).



Output

For each id of a house in Amsterdam's numbering system, you have to output a codified version of the ID just as the police usually do. Each output goes on one line.

Example

Input	Output
abbhocx	15534239
maplortybjce	1534297861011615

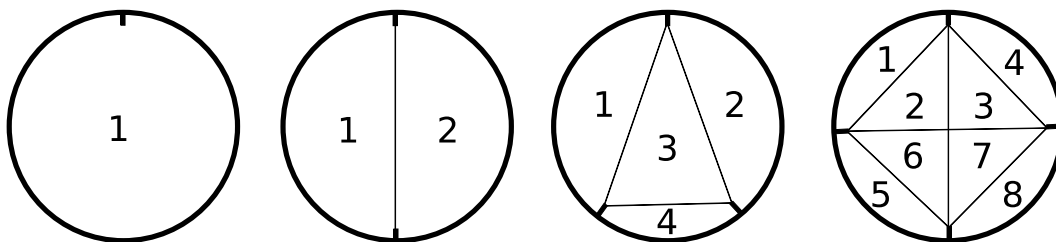
Problem D. Juanma and the Drinking Fountains

Input: Standard
 Output: Standard
 Author(s): Gerson Yesid Lázaro Carrillo - UFPS Colombia

Juanma is a very friendly guy who is worried about the wellness of his classmate. Given the increasing heat wave he decided to put n drinking fountains across the campus so his classmates won't be thirsty all the day.

The campus have circular shape, with a big wall surrounding. To avoid hits, the drinking fountains will be place next to the wall, in the border of the campus.

Juanma is a curious guy and he wants to know what is the largest number of regions that he can create if he join all the drinking fountains with straight lines, can you help him?



Campus with 4 drinking fountains and the resulting regions numbered.

Input

Input begins with an integer t , the number of test cases, followed by t lines, each line contains an integer n ($1 \leq n \leq 200$) that represents the number of drinking fountains that Juanma has placed.

Output

For each test case print a line with the largest number of regions that can be created.

Example

Input	Output
6	1
1	2
2	4
3	8
4	16
5	31
6	



Problem E. Elephants

Input: Standard
Output: Standard
Author(s): Daniel Vega Santos - UFPS Colombia

“ N elephants went out to play on a spider web one day”. Having a set of M elephants, each one with a weight w_i where $1 \leq i \leq M$, and knowing the maximum weight that the spider web supports, what is the largest number of elephants that you can put in the spider web without breaking it?

Input

The first line of input contains a non negative integer meaning the number of test cases. Each case starts with a line with two integers M and W , the number of elephants and the maximum weight that the spider web supports ($1 \leq M \leq 10^5$ and $1 \leq W \leq 10^8$). The next line contains M numbers w_i representing the weight of each elephant ($1 \leq w_i \leq 10000$).

Output

Print a single line per test case with the largest number of elephants that you can put in the spider web without breaking it.

Example

Input	Output
3	1
5 14	4
10 15 16 17 18	3
4 20	
1 2 3 4	
5 22	
9 1 8 7 7	

Problem F. Funny day in Playland

Input: Standard
Output: Standard
Author(s): Melissa Delgado - UFPS

Little Arya wants a lot of fun, that's why she is visiting Playland today. Playland is a very particular adventure park formed by N different attractions. Playland classifies its attractions in categories (roller coaster, terror, aquatic, extreme, ...) and each attraction belongs at least one and at most two categories. Each Playland's attraction works with a ticket system, if you want to use an attraction you must give a ticket from one of the categories this attraction belongs to, when you leave the attraction you will receive a ticket from other category the attraction belongs to (different from the one you gave when entering) or from the same category if the attraction belongs only to one.

To begin the adventure Arya must choose one ticket that allows her entry in the attraction that she choose, after that she must follow the ticket exchange rule explained above. Arya is a girl with lot of energy and she wants to enjoy all the attractions of Playland but without repeating any (that would be consider boring and Arya just wanna have fun), but it is a very difficult choice.

For example, suppose there are 4 attractions in Playland, numbered from 0 to 3. Attraction 0 belongs to the categories roller coaster and aquatic; attraction 1 belongs only to roller coaster, attraction 2 belongs to aquatic and extreme and attraction 3 belongs to terror and roller coaster. If Arya starts her adventure in the attraction 0 she can enter with the roller coaster or aquatic ticket and will receive the other when she leave the attraction. If she choose the roller coaster ticket then she will receive an aquatic ticket and only can entry in attraction 2, when she leaves attraction 2 she will receive an extreme ticket and can't go to any other attraction. If she had chosen the aquatic ticket at the beginning she would receive a roller coaster ticket and then she could go to attraction 1 or 3. If she chooses attraction 3 when she leaves she will receive a terror ticket and again can't go anywhere else. If she chooses attraction 1 she will receive a roller coaster ticket again when leaving and can only go to attraction 3 but she will never go to attraction 2 this way. It isn't possible to visit all the attractions starting at attraction 0. However, it is possible to start in attraction 2 with a terror ticket, leaving with an aquatic ticket, then visit attraction 0 leaving with a roller coaster ticket, visit attraction 1 and leaving again with roller coaster ticket and, at last, visit attraction 3.

As you can see, choose the attraction where the adventure must starts is not an easy choice, that's why Arya needs your help to know if it is possible to choose an attraction to start such that she can visit all attractions from Playland only once. Can you help Arya?

Input

The input contains several test cases. The first line of a test case contains two integers N and C , separated by one space, denoting respectively the number of attractions ($1 \leq N \leq 30000$) and the number of categories in Playland ($1 \leq C \leq 10000$). Each of the next C lines describes a category. Every category starts with one integer K ($0 \leq K \leq N$) and then K integers representing the attractions who belongs to this category. All integers are separated by single spaces and the attractions are numbered from 0 to $N - 1$. Each attraction will appear at least once and at most twice and no attraction will be repeated on the same category.

Output

For each test case you have to print a single line, containing the integer -1 if it's not possible to match the requirements or one integer representing the attraction where Arya can start her adventure. If there are multiple correct answers, print the smallest one.



Example

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

Problem G. The price is correct

Input: Standard
 Output: Standard
 Author(s): Gerson Lázaro - UFPS Colombia

People use to say that developers are unsociable. To prove that this is not true (well, and for win some money too) Douglas decided to go to the happiness contest in the television: The Price is Correct. The rules of the contest are really easy:

Douglas has to stand on a grid initially off. When the game starts, different squares begin to turn on and off. When a square is on, it shows a number in dollars. Douglas must run over all the grid, standing on the lighted squares; for every square that Douglas reaches before it turns off, he will win the amount of money that the square shows.

Every time that a square is turned on, last a second on and then off. However, it's possible that in the next second the square turns on again, with the same or other value. It is also possible that there are several lighted squares at the same time, and of course Douglas will be able to stand just one at a time.

Unfortunately, Douglas isn't free to run in any direction. Douglas will always begin in the middle of a square and every step he takes will be only to the center of an adjacent square. Developers are really fast to think but they are really slow to move so every step Douglas take will last one second. This slowness will make Douglas lose a lot of prizes, so he wants to know what is the sequence of step that he should take to ensure the largest amount of money. Given the initial position of Douglas, the appearing time and the amount of money of each prize, can you answer Douglas's question?

Input

Input begins with an integer t , the number of test cases. Each case begins with 3 integers N , M and P ($1 \leq N, M \leq 20$, $1 \leq P \leq 500$), that represents the number of rows, the number of columns and the amount of prizes, following that there will be a line with two integers X_o and Y_o ($1 \leq X_o \leq n$, $1 \leq Y_o \leq m$) Douglas's initial position in the grid. After that there will be p lines with 4 integers: X_i , Y_i , T_i , V_i , ($1 \leq X_i \leq N$, $1 \leq Y_i \leq M$, $1 \leq T_i \leq 2 * P$, $1 \leq V_i \leq 1000$), the row and the column where the prize is, the second that the prize will appear and the value in dollars for the i -th prize. There will not be two prizes in the same square at the same time.

Output

Prints a single line for test case: an integer number representing the maximum number of dollars that Douglas can win.

Example

Input	Output
1 4 3 4 1 1 1 2 1 10 3 1 3 5 3 3 3 15 2 1 4 15	25



Problem H. Are you ok?

Input: Standard
Output: Standard
Author(s): Gerson Lázaro - UFPS Colombia

A very popular social network has developed a wonderful tool called “Are you ok?” to check the safety of its users when a catastrophe occurs. The tool is very simple: When a catastrophe occurs, the social network builds a map of the affected area and send a notification to the Mobile’s phones of all of the users who are in the area, doing just one simple question: Are you ok?

Unfortunately, a couple of days ago the tool failed. After a big emergency in Grebulonia a lot of users of the social network in Logombia received this notification message, but what’s the problem? The problem is that Logonia is in the other side of the world, far far away of Grebulonia. The social network doesn’t want this happens again so they hired you to do the following task: After each emergency situation they will give you a map of the affected area (represented as a polygon formed by a list of consecutive vertices in the Cartesian coordinate system) and the location of the users. You must check how many users are in the affected area and should receive the notification (excluding those who are in the border of the map).

Input

The input starts with an integer t , the number of test cases. Each case is formed by multiple lines: The first line contains two integers a and b ($3 \leq a \leq 500$, $1 \leq b \leq 1000$), the number of vertices in the map and the number of users. This line is followed by a lines each one with two integers x_i and y_i , denoting the vertices of the map (Vertices are given in clockwise order). Finally, there are b lines, each one with two integers x_i and y_i denoting the location of each user. ($-1000000 \leq x, y \leq 1000000$.)

Output

Print one line per test case, the number of users that must receive the “Are you ok?” notification.

Example

Input	Output
1 11 6 -1 2 1 0 3 2 4 1 6 3 6 5 5 6 3 4 1 4 0 5 -2 4 5 4 4 3 3 5 2 3 0 5 -2 5	3

Problem I. Presidential Election

Input: Standard
Output: Standard
Author(s): Gerson Lázaro - UFPS Colombia

Logombia is a beautiful country located in the middle of the continent, surrounded by two seas and constituted as a democratic state. Now it's time for the Logombians to choose their president, but the organization of the event is a little late ... that's why they hired you to automatize the process.

As you well know, the right wing always postulate a candidate, like the left wing does too. On the other hand, in Logombia exists a lot of independent political factions, of which at least one postulate a candidate. With this conditions, there will be at least 3 candidates in the first round of elections. If a candidate gets a percentage greater than or equal to 50.1% will be elected as a president, in the other case the two candidates with the most votes will pass to a second round.

Because of its mountainous geographical condition, there aren't a very effective way to communicate different states in the country. Each state makes the election in a defined day and when they have finished counting votes they send a report to the capital where it indicate the amount of people who vote and the percentage of votes that each candidate gets in the state. It is guaranteed that the number of votes for each candidate in each state is an integer number.

Losers candidates will organize protest marches and will blame the capitalism or Communism according to the case, but that is not your problem. Your work is process all the reports sent by each state and define who is the new president and how many votes he obtains, or well, who are the two candidates that dispute the second round and the amount of votes each one gets.

Input

Input begins with a non negative integer, the number of test cases. Each case begins with a line containing 2 integers numbers A and B , the number of candidates and the number of states ($3 \leq A \leq 500$ and $1 \leq B \leq 1000$), followed by B lines, each one with A real numbers separated by a blank space, representing the vote's percentage P_i ($0.0 \leq P_i \leq 100.0$) of each candidate from P_1 to P_A and an integer number V ($1 \leq V \leq 10^8$), the amount of voters in that state. The sum of the percentages in each state is equal to 100.

Output

For each case, if there is no need to a second round, print a single line containing the number of the candidate who wins and the number of votes he gets, otherwise, prints two lines with the number and the amount of votes of each candidate who passed to the second round, print first the candidate with most votes. In a case of a tie print the results order by the id of the candidates. Print a blank line between consecutive test cases.



Example

Input	Output
3	4 3895
4 3	3 3655
25.0 25.0 25.0 25.0 4500	
26.0 24.0 27.0 23.0 9000	1 510
10.0 10.0 10.0 70.0 1000	
3 1	1 2788000
51.0 24.0 25.0 1000	2 2788000
2 2	
0.7 99.3 2788000	
99.3 0.7 2788000	

Problem J. Josephus lottery II

Input: standard
 Output: standard
 Author(s): Hugo Humberto Morales Peña - UTP Colombia

The professor Humbertov Moralov wants to make a raffle between the 100 students of his Data Structure class and Pepito (Student of this group) suggests to use the Josephus problem to determine who is the winner of the raffle, but the thing is that you can know beforehand the winning position if you know the value of n (the total of students in the raffle) and the value k (amount of movements to throwing out students from the circle).

The price is kind of interesting, the winner won't have to present the final exam, and for that reason the professor Humbertov proposes the following variant to Josephus problem: "Take the student class list, in which the students are numbered from 1 to 100, then, organize this numbers in a circle and begin to count from number 1 until getting the value k (Take into account that you count clockwise), the student with number k in the list is removed from the circle, and now you begin to count from the number of the next student ($k + 1$), but in counterclockwise, the student with the number in which the count stopped is removed from the circle, and then you repeat the process alternating between counterclockwise and clockwise counting until you get the winner of the raffle".

The professor Humbertov wants to be sure that student that will win the raffle will be Pepito, because Pepito is the best student in his course, and for that reason he must ensure that pepito's position will be the winning position, so in order to accomplish this you have to calculate the minimum value k that generates that position and help the Professor Humbertov, after this favor he for sure will increase your grades in his class of formal languages and grammars.

Input

The input contains several test cases. Each test case has only one line, in which there is a positive integer m ($1 \leq m \leq 100$) that represents the position of Pepito in the class list, remember that Pepito is the one who must win the raffle. The input ends with a line containing a zero, which must not be processed.

Output

For each test case, you have to print in one line the number k that will ensure that Pepito Perez will win the raffle. it's guaranteed that $1 \leq k \leq 10^3$.

Example

Input	Output
1	115
15	36
30	364
88	750
0	



Problem K. Sudoku

Input: Standard
Output: Standard
Author(s): Melissa Delgado - UFPS Colombia

My friend Gerson loves to resolve sudokus. A sudoku is a numeric puzzle formed by a grid of $n \times n$, divided in n grids of $\sqrt{n} \times \sqrt{n}$. Every row, column and grid must contain all the numbers from 1 to n , without repeat. Gerson can resolve 20 sudokus per day, the problem is that 19 of them are wrong. Can you make a program that given the solutions found by Gerson tell him if they are wrong or right?

Input

The first line of input contains a integer t , the number of test cases. Each case begins with an integer n ($1 \leq n \leq 25$), it is guaranteed that n have a square root. This line is followed by n lines, each one with n numbers $m_{i,j}$ separated by a blank space ($1 \leq m_{i,j} \leq n$, with $1 \leq i, j \leq n$).

Output

For each test case prints a single line with the word “yes” if the sudoku has been resolved correctly or “no” otherwise.

Example

Input	Output
2	yes
4	no
1 2 3 4	
3 4 1 2	
2 3 4 1	
4 1 2 3	
9	
1 2 3 4 5 6 7 8 9	
2 3 4 5 6 7 8 9 1	
3 4 5 6 7 8 9 1 2	
4 5 6 7 8 9 1 2 3	
5 6 7 8 9 1 2 3 4	
6 7 8 9 1 2 3 4 5	
7 8 9 1 2 3 4 5 6	
8 9 1 2 3 4 5 6 7	
9 1 2 3 4 5 6 7 8	

Problem L. Multistory Labyrinth

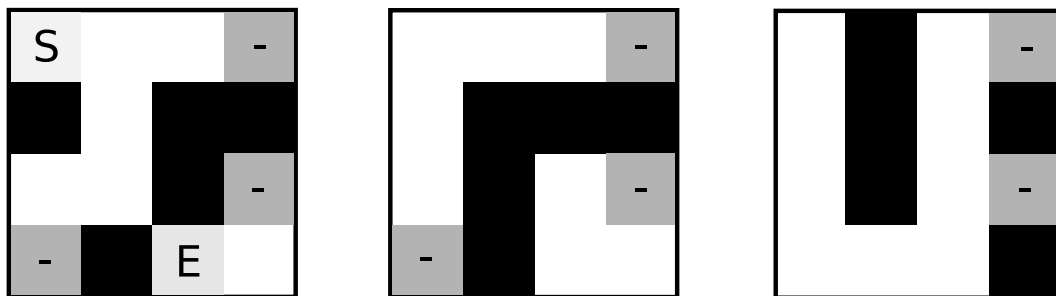
Input: Standard
 Output: Standard
 Author(s): Gerson Lázaro - UFPS Colombia

Ada has found an old video game called multistory labyrinth. As its name indicates, the game consists in a labyrinth (a field with multiple roads and walls where you should find a route from an origin point to a destination point) with a little difference: This labyrinth is conformed for several floors (like a building) where each floor belongs to the same labyrinth and you have elevators that connects different floors. The source point and the destination point could be in any floor.

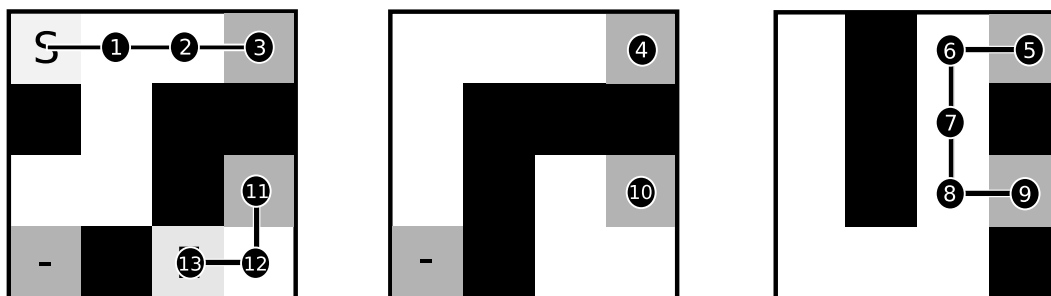
Each movement made by Ada in x , y or z (moving to north, sur, east, west, up or down a floor) counts like a step. Ada is a strategic women and she doesn't want spend more steps than the necessary to resolve the labyrinth. Can you make a program that compute the minimum number of steps required to reach the end of the labyrinth?

The labyrinth is represented like a set of floors, and every floor is described as a grid with the next conventions:

- “#” Represents a wall.
- “.” Represents a free square.
- “-” Represents an elevator (Can go up or down to the next floor if and only if the next floor have an elevator in the same point). Elevators could be used as a free squares too, meaning that Ada could pass through them without changing floor.
- “S” Starting point. Could be in any floor.
- “E” End point. Could be in any floor.



Example of one text case representing the first, second and third floor. The black squares denote walls, the white free squares and those marked with an “-” are elevators.



Solution to the above problem. Each circle denotes an step. Note how from the first floor go to the third and then down again to the first, reaching the end point in 13 steps.

Input

Input consist of multiple test cases. Each case starts with 3 integers l , w and h denoting respectively the number of rows and columns of each floor of the labyrinth, followed by the number of floors ($1 \leq w, l, h \leq 100$). After that will be the description of each one of the h floors (Starting from the floor 1 and ending with the floor h). Each floor is conformed for w lines of l characters denoting the floor with the conventions given in the exercise. It is guaranteed that there will be one and only one character “E” and one and only one character “S” in the description of the building for each test case. There is a blank space after the description of each floor. Input ends when $l = 0$, $w = 0$, $h = 0$.

Output

For each test case print a single line: the minimum number of steps needed to reach the end of the labyrinth (or -1 if it's not possible to find a way).



Example

Input	Output
4 4 3	13
S..-	3
###	
..#-	
-#E.	
...-	
.###	
.#.-	
-#..	
.#.-	
.#.#	
.#.-	
...#	
2 4 2	
.-..	
....	
S--E	
####	
0 0 0	