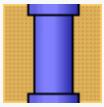
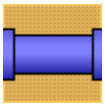
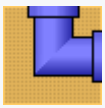
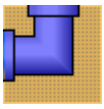
1. Company S has developed an industrial endoscope available to explore inner part of the decrepit water pipes. It is possible to explore the inner part of the pipes putting the endoscope in a certain part of the pipe. The endoscope can be moved in the pipe only. Meanwhile, when the pipes are connected to each other, if the length of the endoscope is long enough to explore ,then it is able to inspect the connected pipes. However, we cannot observe every pipe because the length of endoscope is limited. When the map of the ground water pipe, the location where the endoscope to out in, and the length of the endoscope is given, calculate the number of pipe which are available to explore. Length of endoscope means the range upto which endoscope can explore. There are seven kind of pipes, and description for each pipe are shown below:

S.No	Pipe	Connected to
1		Up, Down, Left, Right
2		Up, Down
3		Left, Right
4		Up, Right
5		Down, Right
6		Down, Left
7		Up, Left

When the map of the ground water pipe, the location where the endoscope to out in, and the length of the endoscope is given, calculate the number of pipe which are available to explore. Length of endoscope means the range upto which endoscope can explore.

Input

In the first line, T, the number of total test cases is given. From the second line, T test cases are given. In the first line of each test case, N, the height of the map of the ground water pipes, M, the width, R, the vertical location of the water pipe where to put in the endoscope, C, the horizontal location of it, and the length of the endoscope L are given. In the following N lines information of the map of ground water pipe is given. Each line has M numbers. Each number (from 1 to 7) means the type of water pipe for that point. 0 means there is no water pipe buried in that place.

Output

Print the respective answer for T test cases in total for T lines. The answer is the number of water pipes which is available to observe using the endoscope.

Constraints

$1 \leq T \leq 100$

$1 \leq N, M \leq 50$

$0 \leq X < N$

$0 \leq Y < M$

$1 \leq L \leq 20$

2. Men's restroom problem : It is a well-researched fact that men in a restroom generally prefer to maximize their distance from already occupied stalls, by occupying the middle of the longest sequence of unoccupied places. For detailed version, check the following link.
Link : https://stackoverflow.com/questions/32645046/urinal-algorithm-a-simple-optimization

3. Given a graph print either of the set of the vertices that are colored with the same color. And if the graph is not bipartite print "-1". Test cases also included the cases when a graph is not connected.

4. You'll be given a grid as below:

```
                      0 1 0 2 0 --> Non highlighted part
                      0 2 2 2 1
                      0 2 1 1 1
                      1 0 1 0 0
                      0 0 1 2 2
                      1 1 0 0 1
                      x x S x x  -->highlighted yellow
 In the grid above,
```

1: This cell has a coin.
2: This cell has an enemy.
0: It contains nothing.
The highlighted(yellow) zone is the control zone. S is a spaceship that we need to control so that we can get maximum coins.
Now, S's initial position will be at the center and we can only move it right or left by one cell or do not move. At each time, the non-highlighted part of the grid will move down by one unit.
We can also use a bomb but only once. If we use that, all the enemies in the 5×5 region above the control zone will be killed.
If we use a bomb at the very beginning, the grid will look like this:

```
0 1 0 2 0  --> Non highlighted part
0 0 0 0 1
0 0 1 1 1
1 0 1 0 0
0 0 1 0 0
1 1 0 0 1
x x S x x  --> highlighted yellow
 As soon as, the spaceship encounters an enemy or the entire grid has come down, the
game ends.
For example,
At the very first instance, if we want to collect a coin we should move left **(
coins=1)**. This is because when the grid comes down by 1 unit we have a coin on the
second position and by moving left we can collect that coin. Next, we should move right
to collect another coin **( coins=2)** .
After this, remain at the same position **( coins=4)**.
This is the current situation after collecting 4 coins.
0 1 0 2 0               0 1 0 0 0
0 2 2 2 1 -->after using 0 0 0 0 1
x x S x x -->bomb        x x S x x
```

Now, we can use the bomb to get out of this situation. After this, we can collect at most 1 coin. So maximum coins=5.

5. A Research team want to establish a research center in a region where they found some rare-elements.They want to make it closest to all the rare-elements as close as possible so that they can reduce overall cost of research over there.It is given that all the rare-element's location is connected by roads.It is also given that Research Center can only be build on road.Team decided to assign this task to a coder.If you feel you have that much potential.
   Here is the Task :- Find the shortest of the longest distance of research center from given locations of rare-elements.
   locations are given in the matrix cell form where 1 represents roads and 0 no road.. number of rare-element and their location was also given(number<=5) and order of square matrix was less than equal to (20).
6. Given a Binary Tree where each node has positive and negative values. Convert this to a tree where each node contains the sum of the left and right sub trees in the original tree. The values of leaf nodes are changed to 0.
7. Write a function that calculates the day of the week for any particular date in the past or future. A typical application is to calculate the day of the week on which someone was born or some other special event occurred.
8. Given a Binary Tree, write a function that returns the size of the largest subtree which is also a Binary Search Tree (BST). If the complete Binary Tree is BST, then return the size of whole tree.
9. You are given an array of integers which represents positions available and an integer c(cows).
   Now you have to choose c positions such that minimum difference between cows is maximized.

```
For example,
1 3 5 8 10
c=3
output: 4
1 5 10
```

10. Given a Binary Tree and a node x in it, find distance of the closest leaf to x in Binary Tree. If given node itself is a leaf, then distance is 0.
11. Given random points in a 2-D plane, construct a convex polygon with minimum area of covering and which encompasses all the given points.
12. Given a graph, find out if it can be colored using 2 colors. If Yes, print numbers of vertices with any one of the colour, followed by such vertices in sorted order. If No just print -1
13. Given a 2 D matrix where 1 represent the places where the frog can jump and 0 represent the empty spaces, the frog can move freely in horizontal direction (on 1's only) without incurring any cost (jump). A vertical jump from a given point of the matrix to other point on the matrix can be taken (on 1's only) with cost as the number of jumps taken.

Given a source and destination, the frog has to reach the destination minimizing the cost (jump)

14. Given a directed graph. Check whether a graph contain a cycle or not.
15. Given a level K , you have to find out the sum of data of all the nodes at level K in a binary tree. Input is given as: `(P(C()())(C()())) P is for Parent, C is for child. if parent has one child : (P(C()())()) if parent has no child : (P()())`
16. A company sells its products with a unique serial number on it. Company has has found that there are some products that don't sell well which are identified to have ominous numbers in the serial number of the product. So if a serial number of the product contains atmost 'k' ominous number then it won't sell. Given a range form s to e, you need to find number of products that would sell, leaving out the products that contains atmost 'k' ominous numbers.

    `Input: First line contains the number of test cases, followed buy the range s to e, 1`

17. You are given N unique numbers a1<a2<a3<...an. Find out the count of all possible binary search tress that can be constructed using these numbers. For example with 3 elements 1,2,3 there are 5 possible BST and for 1,2,3,4 there are 14 BST.

18. Given an NxM (N rows and M columns) integer matrix with non-negative values (0..MAX_INT inclusive). What is the maximum sum from going top left (0, 0) to bottom right (N-1, M-1) ? The condition is that when you're at point (p, q), you can only move to either right (p, q+1) or down (p+1, q).

19. Mr. Kim has to deliver refrigerators to N customers. From the office, he is going to visit all the customers and then return to his home. Each location of the office, his home, and the customers is given in the form of integer coordinates (x,y) ($0 \le x \le 100$, $0 \le y \le 100$) . The distance between two arbitrary locations (x1, y1) and (x2, y2) is computed by $|x1-x2| + |y1-y2|$, where $|x|$ denotes the absolute value of x; for instance, $|3|=|-3|=3$. The locations of the office, his home, and the customers are all distinct. You should plan an optimal way to visit all the N customers and return to his among all the possibilities. You are given the locations of the office, Mr. Kim's home, and the customers; the number of the customers is in the range of 5 to 10. Write a program that, starting at the office, finds a (the) shortest path visiting all the customers and returning to his home. Your program only have to report the distance of a (the) shortest path.

    Constraints

    $5 \le N \le 10$. Each location (x,y) is in a bounded grid, $0 \le x \le 100$, $0 \le y \le 100$, and x, y are integers.

    Input

You are given 10 test cases. Each test case consists of two lines; the first line has N, the number of the customers, and the following line enumerates the locations of the office, Mr. Kim's home, and the customers in sequence. Each location consists of the coordinates (x,y), which is reprensented by 'x y'.

Output

Output the 10 answers in 10 lines. Each line outputs the distance of a (the) shortest path. Each line looks like '#x answer' where x is the index of a test case. '#x' and 'answer' are separated by a space.

I/O Example

Input (20 lines in total. In the first test case, the locations of the office and the home are (0, 0) and (100, 100) respectively, and the locations of the customers are (70, 40), (30, 10), (10, 5), (90, 70), (50, 20).)

5 ← Starting test case #1

0 0 100 100 70 40 30 10 10 5 90 70 50 20

6 ← Starting test case #2

88 81 85 80 19 22 31 15 27 29 30 10 20 26 5 14

10 ← Starting test case #3

39 9 97 61 35 93 62 64 96 39 36 36 9 59 59 96 61 7 64 43 43 58 1 36

Output (10 lines in total)

#1 200

#2 304

#3 366

20. Given a graph question. We have to find the loop in the graph if it exist and print the nodes of the loop in sorted order.

21. You are given an old touch smartphone numbers having dial pad and calculator app. The goal is to type a number on dialpad. Calculator have 1-9 and +, -, * , /, = as operations. But as phone is old, some of the numbers and some operations can't be touched. But you can always make a number using other numbers and operations. There could be multiple

ways of making a number. You have to find minimum operation for making a number. For ex: lets say 1,4,6,7,8,9 works and +,-,* works. 2,3,5 and / doesn't work. If you have to type 18-> 2 operations. (Each touch is considered an operation). If you have to type 5 -> '1+4=' that requires 4 operations. There could be other ways to make '5'.
The goal is to find minimum operations.

22. There are N pots. Every pots has some water in it. They may be partially filled . Every pot is associated with overflow number O which tell how many minimum no. of stones required for that pot to overflow. The crow know O1 to On(overflow no. for all the pots). Crow wants some K pots to be overflow. So the task is minimum number of stones he can make K pots overflow in worst case.

    Array of overflow no--. {1,...,On}
    Number of pots--n
    No of pots to overflow-- k

    Let say two pots are there with overflow no.s {5,58}, and crow has to overflow one pot(k=1). So crow will put 5 stones in pot with overflow no.(58), it will not overflow, then he will put in pot with overflow no.(5), hence the total no. of stones to make overflow one pot is=10.

23. You are given 2 convex hulls. Find all the common points that lie in the intersection of these 2 convex hulls.

24. There is one spaceship. X and Y co-odinate of source of spaceship and destination spaceship is given. There are N number of warmholes; each warmhole has 5 values. First 2 values are starting co-ordinate of warmhole and after that value no. 3 and 4 represents ending co-ordinate of warmhole and last 5th value is represents cost to pass through this warmhole. Now these warmholes are bi-directional. Now the to go from (x1,y1) to (x2,y2) is abs(x1-x2)+abs(y1-y2). The main problem here is to find minimum distance to reach spaceship from source to destination co-ordinate using any number of warm-hole. It is ok if you wont use any warmhole.

25. There is an island surrounded by oil mines. You will be given n companies and m oil mines having values. You have to distribute the mines to "n" companies in fair manner. Remember the companies can have oil mines adjacent to each other and not in between of each others.After distributing them compute the difference of oil mines from the company getting highest and company getting lowest. This number should be minimum.(then only the distribution can be termed as fair).

    ```
    Example
    ```

```
Input
2
2 4
6 13 10 2
2 4
6 10 13 2

output
5
1
```

26. There is a n x n matrix with only 0s & 1s. Letters are formed using 1 and 0. For eg.-

```
U is 1 0 1,  V is 1 0 1
 1 0 1        1 0 1
 1 1 1        0 1 0
```

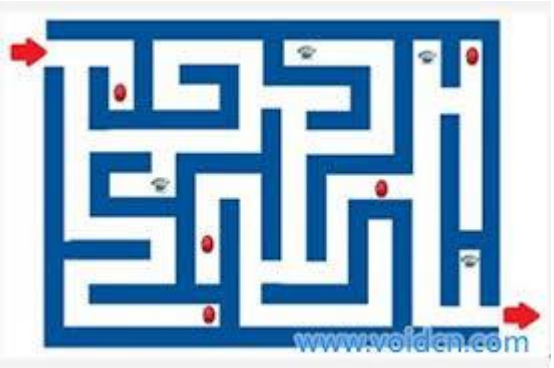
Likewise there are 6 letters and they can rotated in 90, 180, 270, 360 degree. And if there is a letter, the next column would be filled with 0. Eg.

```
            V- 1 0 1 0
               1 0 1 0
               0 1 0 0
```

So we have to count the number of each letter in the matrix.

27. There is a maze that has one entrance and one exit. Jewels are placed in passages of the maze. You want to pick up the jewels after getting into the maze through the entrance and before getting out of it through the exit. You want to get as many jewels as possible, but you don't want to take the same passage you used once.

When locations of a maze and jewels are given, find out the greatest number of jewels you can get without taking the same passage twice, and the path taken in this case.



Input

There can be more than one test case in the input file. The first line has T, the number of test cases. Then the totally T test cases are provided in the following lines (T ≤ 10).

In each test case, In the first line, the size of the maze N (1 ≤ N ≤ 10) is given. The maze is N×N square-shaped. From the second line through N lines, information of the maze is given. “0” means a passage, “1” means a wall, and “2” means a location of a jewel. The entrance is located on the upper-most left passage and the exit is located on the lower-most right passage. There is no case where the path from the entrance to the exit doesn’t exist.

Output

From the first line through N lines, mark the path with 3 and output it. In N+1 line, output the greatest number of jewels that can be picked up. Each test case must be output separately as a empty.

28. Mr. Lee has to travel various offices abroad to assist branches of each place. But he has a problem. The airfare would be real high as all offices he has to visit are in foreign countries. He wants to visit every location only one time and return home with the lowest expense. Help this company-caring man calculate the lowest expense.

```
Time limit : 1 second (java : 2 seconds)
```

Input format

Several test cases can be included in the inputs. T, the number of cases is given in the first row of the inputs. After that, the test cases as many as T (T ≤ 30) are given in a row. N, the number of offices to visit is given on the first row per each test case. At this moment, No. 1 office is regarded as his company (Departure point). (1 ≤ N ≤ 12) Airfares are given to move cities in which branches are located from the second row to N number rows. I.e. jth number of ith row is the airfare to move from ith city to jth city. If it is impossible to move between two cities, it is given as zero.

Output format

Output the minimum airfare used to depart from his company, visit all offices, and then return his company on the first row per each test case.

Example of Input

2
5

0	14	4	10	20
14	0	7	8	7
4	5	0	7	16
11	7	9	0	2
18	7	17	4	0

5

9	9	2	9	5
6	3	5	1	5
1	8	3	3	3
6	0	9	6	8

6 6 9 4 8

Example of Output

30
18

29. There is a mobile piece and a stationary piece on the N×M chessboard. The available moves of the mobile piece are the same as set out in the image below. You need to capture the stationary piece by moving the mobile piece with the minimum amount of moves.

    Write a program to find out the minimum number moves to catch a piece.

    Time limit:1 second (java: 2 seconds)

    Input

    Several test cases can be included in the inputs. T, the number of cases is given in the first row of the inputs. After that, the test cases as many as T (T ≤ 20) are given in a row. N, the numbers of the rows and M, the number of columns of the chessboard are given in the first row of each test case. R & C is the location information of the attacking piece and S & K is the location of the defending pieces and are given in the row at the second line. However, the location of the uppermost end of the left end is (1, 1)

    Output

    For each test case, you should print "Case #T" in the first line where T means the case number. For each test case, you should output the minimum number of movements to catch a defending piece at the first line of each test case. If not moveable, output equals '-1'.

30. You are busy to promote a newly released film in a movie theatre . the title is 'Biochemical Laughing Bomb' which is about terror. Guerillas drop a biochemical laughing bomb in the middle of a city. once exposed, you have to laugh all your life. The bomb will contaminate four people around it during t second, and another four around each of them during another one second. However, you won't be contaminated if you are not in the adjacent four directions. as the below shows the location of the bomb and affected people , and shows contamination process in seconds and you can figure out that the whole city is contaminated in 8 seconds. In order to protect the city from the epidemic, create a program that figures out when the city will be contaminated by the bomb for the last.

    Input

    Several test cases can be included in the inputs. T, the number of cases is given in the first row of the inputs. After that, the test cases as many as T ($T \leq 30$) are given in a row. The row and column of the city, N and M are given by being separated with a blank on the first row of each test case. ($1 \leq N, M \leq 100$) The status within city is given by being separated with a blank from the second row to N number rows. 1 means people exist and 0 means people do not exist. The coordinate of the row and column on which the bomb fall is given by being separated with a blank on the last row.

    Output

    For each test case, you should print "Case #T" in the first line where T means the case number. For each test case, you should output how long does it take to contaminate al people on the first row of each test case.

31. Given number of pipes 1..n, Find two largest pipes of maximum length possible. Ex: input - 1,2,3,4,6 Output - The maximum length possible is 8. Pipe1 - 2,6 Pipe2 - 1,3,4

32. A Research team want to establish a research center in a region where they found some rare-elements. They want to make it closest to all the rare-elements as close as possible so that they can reduce overall cost of research over there. It is given that all the rare-element’s location is connected by roads. It is also given that Research Center can only be build on road. Team decided to assign this task to a coder. If you feel you have that much potential..

    Here is the Task :- Find the shortest of the longest distance of research center from given locations of rare-elements.

Locations are given in the matrix cell form where 1 represents roads and 0 no road.. Number of rare-element and their location was also given(number<=5) and order of square matrix was less than equal to (20).

33. There is a source (S) and destination (D) and a spacecraft has to go from S to D. There are N number of wormholes in between which has following properties:

    Each wormhole has an entry and an exit. Each wormhole is bi-directional i.e. one can enter and exit from any of the ends. The time to cross the wormhole is given and the space craft may or may not use the wormhole to reach D. The time taken to travel outside wormhole between two points (x1, y1) and (x2, y2) is given by a formula |x1 - x2| + |y1 - y2|

    where, (x1, y1) and (x2, y2) are the co-ordinates of two points. The co-ordinates of S and D are given and we have to find the minimum time to reach D from S.

    Note: It's not mandatory to consider all the wormholes.

34. There are n balloons and n bullets and each balloon is assigned with a particular number (point). Whenever a particular balloon is shot the no of points increases by 1.the multiplication of point assigned to balloon on left and that of right side.

    2.point assigned to left if no right exists

    3.point assigned to right if no left exists.

    4.the point assigned to itself if no other balloon exists.

    You have to output the maximum no of points possible.

    Input

    1 2 3 4

    Output

    20