

TCS CodeVita Sheet by Arsh

The major aim of this sheet is to make you aware about the important topics and some previous year questions that have been a part of TCS CodeVita.

Make sure you revise these concepts and have an understanding and idea of previous year questions for getting to know the level of questions .

Topics for Online Pre - Qualifier Round :

The online test comprises of 6 Questions with an increasing difficulty level :

Question No

1 to 3 : Easy to Medium

4 to 6 : Medium to Hard

Important Topics (Question 1 - 3) :

1. Adhoc Problems
2. Maths and Calculation Based
3. Number Theory
4. Searching Sorting
5. 2 Pointers Approach
6. C++ STL , Collection Framework Java
7. Stacks and Queues
8. Binary Search

Question : 4 to 6

- 1.Dynamic Programming
- 2.Graphs
- 3.Heaps
- 4.Recursion
- 5.Segment Trees

Previously asked Problems :

Question 1 . Sam is an eligible bachelor. He decides to settle down in life and start a family. He goes bride hunting.

He wants to marry a girl who has at least one of the 8 qualities mentioned below:-

- 1) The girl should be rich.
- 2) The girl should be an Engineer/Doctor.
- 3) The girl should be beautiful.
- 4) The girl should be of height 5.3".

5) The girl should be working in an MNC.

6) The girl should be an extrovert.

7) The girl should not have spectacles.

8) The girl should be kind and honest.

He is in search of a bride who has some or all of the 8 qualities mentioned above. On bride hunting, he may find more than one contenders to be his wife.

In that case, he wants to choose a girl whose house is closest to his house. Find a bride for Sam who has maximum qualities. If in case, there are more than one contenders who are at equal distance from Sam's house; then

print "Polygamy not allowed".

In case there is no suitable girl who fits the criteria then print **"No suitable girl found"**

Given a Matrix $N \times M$, Sam's house is at (1, 1). It is denoted by 1. In the same matrix, the location of a marriageable Girl is also denoted by 1. Hence 1 at location (1, 1) should not be considered as the location of a marriageable Girl's location.

The qualities of that girl, as per Sam's criteria, have to be decoded from the number of non-zero neighbors (max 8-way) she has. Similar to the condition above, 1 at location (1, 1) should not be considered as the quality of a Girl. See Example section to get a better understanding.

Find Sam, a suitable Bride and print the row and column of the bride, and find out the number of qualities that the Bride possesses.

NOTE: - Distance is calculated in number of hops in any direction i.e. (Left, Right, Up, Down and Diagonal)

Constraints

$2 \leq N, M \leq 10^2$

Input Format

First Line contains the row (N) and column (M) of the houses.

Next N lines contain the data about girls and their qualities.

Output

It will contain the row and column of the bride, and the number of qualities that Bride possess separated by a colon (i.e. :).

Explanation

Example 1

Input:

2 9

1 0 1 1 0 1 1 1 1

0 0 0 1 0 1 0 0 1

Output:

1:7:3

Explanation:

The girl and qualities are present at (1,3),(1,4),(1,6),(1,7),(1,8),(1,9),(2,4),(2,6),(2,9).

The girl present at (1,3) has 2 qualities (i.e. (1,4)and (2,4)).

The girl present at (1,4) has 2 qualities.

The Bride present at (1,6) has 2 qualities.

The Bride present at (1,7) has 3 qualities.

The Bride present at (1,8) has 3 qualities.

The Bride present at (1,9) has 2 qualities.

The Bride present at (2,4) has 2 qualities.

The Bride present at (2,6) has 2 qualities.

The Bride present at (2,9) has 2 qualities.

As we see, there are two contenders who have maximum qualities, one is at (1,7) and another at (1,8).

The girl who is closest to Sam's house is at (1,7). Hence, she is the bride.

Hence, the output will be 1:7:3.

Example 2

Input:

6 6

1 0 0 0 0 0

0 0 0 0 0 0
0 0 1 1 1 0
0 0 1 1 1 0
0 0 1 1 1 0
0 0 0 0 0 0

Output:

4:4:8

Explanation:

The bride and qualities are present at (3,3),(3,4),(3,5),(4,3),(4,4),(4,5),(5,3),(5,4),(5,5)

The Bride present at (3,3) has 3 qualities (i.e. (3,4),(4,3) and (4,4)).

The Bride present at (3,4) has 5 qualities.

The Bride present at (3,5) has 3 qualities.

The Bride present at (4,3) has 5 qualities.

The Bride present at (4,4) has 8 qualities.

The Bride present at (4,5) has 5 qualities.

The Bride present at (5,3) has 3 qualities.

The Bride present at (5,4) has 5 qualities.

The Bride present at (5,5) has 3 qualities.

As we see, the girl present in (4,4) has maximum number of Qualities. Hence, she is the bride.

Hence, the output will be 4:4:8.

Question 2 . Rotate a given String in the specified direction by specified magnitude.

After each rotation make a note of the first character of the rotated String, After all rotation are performed the accumulated first character as noted previously will form another string, say FIRSTCHARSTRING.

Check If FIRSTCHARSTRING is an Anagram of any substring of the Original string.

If yes print "YES" otherwise "NO". Input

The first line contains the original string s . The second line contains a single integer q . The i th of the next q lines contains character $d[i]$ denoting direction and integer $r[i]$ denoting the magnitude.

Constraints

$1 \leq \text{Length of original string} \leq 30$

$1 \leq q \leq 10$

Output

YES or NO

Question 3 .

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 $y=-h/2$.

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 Format:

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.

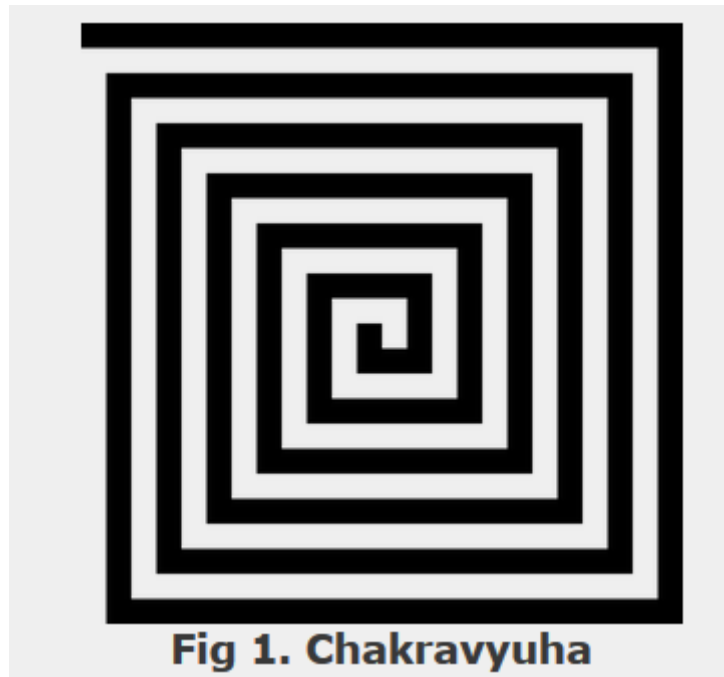
Question 4 .

During the battle of Mahabharat, when Arjuna was far away in the battlefield, Guru Drona made a Chakravyuha formation of the Kaurava army to capture Yudhishthir Maharaj. Abhimanyu, young son of Arjuna was the only one amongst the remaining Pandava army who knew how to crack the Chakravyuha. He took it upon himself to take the battle to the enemies.

Abhimanyu knew how to get power points when cracking the Chakravyuha. So great was his prowess that rest of the Pandava army could not keep pace with his advances. Worried at the rest of the army falling behind, Yudhishthir Maharaj needs your help to track of Abhimanyu's

advances. Write a program that tracks how many power points Abhimanyu has collected and also uncover his trail

A Chakravyuha is a wheel-like formation. Pictorially it is depicted as below



A Chakravyuha has a very well-defined co-ordinate system. Each point on the co-ordinate system is manned by a certain unit of the army. The Commander-In-Chief is always located at the center of the army to better co-ordinate his forces. The only way to crack the Chakravyuha is to defeat the units in sequential order.

A Sequential order of units differs structurally based on the radius of the Chakra. The radius can be thought of as length or breadth of the matrix depicted above. The structure i.e. placement of units in *sequential order* is as shown below

1	2	3	4	5
16	17	18	19	6
15	24	25	20	7
14	23	22	21	8
13	12	11	10	9

Fig 2. Army unit placements in Chakravyuha of size 5

The entry point of the Chakravyuha is always at the (0,0) co-ordinate of the matrix above. This is where the 1st army unit guards. From (0,0) i.e. 1st unit Abhimanyu has to march towards the center at (2,2) where the 25th i.e. the last of the enemy army unit guards. Remember that he has to proceed by destroying the units in sequential fashion. After destroying the first unit, Abhimanyu gets a power point. Thereafter, he gets one after destroying army units which are multiples of 11. You should also be in a position to tell Yudhisthir Maharaj the location at which Abhimanyu collected his power points.

Input Format: First line of input will be length as well as breadth of the army units, say N

Output Format:

- Print NxN matrix depicting the placement of army units, with unit numbers delimited by (\t) Tab character
- Print Total power points collected
- Print coordinates of power points collected in sequential fashion (one per line)

Constraints: $0 < N \leq 100$

Sample Input and Output

SNo	Input	Output
.		

1	2	1 2 4 3 Total Power points : 1 (0,0)
2	5	1 2 3 4 5 16 17 18 19 6 15 24 25 20 7 14 23 22 21 8 13 12 11 10 9 Total Power points : 3 (0,0) (4,2) (3,2)

Question 5.

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 :

$$EMI = \text{loanAmount} * \text{monthlyInterestRate} /$$

$$(1 - 1 / (1 + \text{monthlyInterestRate})^{(\text{numberOfYears} * 12)})$$

Constraints

$$1 \leq P \leq 1000000$$

$$1 \leq T \leq 50$$

$$1 \leq N1 \leq 30$$

$$1 \leq N2 \leq 30$$

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

Question 6.

A crossword puzzle is a square grid with black and blank squares, containing clue numbers (according to a set of rules) on some of the squares. The puzzle is solved by obtaining the solutions to a set of clues corresponding to the clue numbers.

The solved puzzle has one letter in each of the blank square, which represent a sequence of letters (consisting of one or more words in English or occasionally other languages) running along the rows (called “Across”, or “A”) or along the columns (called “Down” or “D”). Each numbered square is the beginning of an Across solution or a Down solution. Some of the across and down solutions will intersect at a blank square, and if the solutions are consistent, both of them will have the same letter at the intersecting square.

In this problem, you will be given the specifications of the grid, and the solutions in some random order. The problem is to number the grid appropriately, and associate the answers consistently with the clue numbers on the grid, both as Across solutions and as Down solutions, so that the intersecting blank squares have the same letter in both solutions.

Rules for Clue Numbering

The clue numbers are given sequentially going row wise (Row 1 first, and then row2 and so on)

Only blank squares are given a clue number

A blank square is given a clue number if either of the following conditions exist (only one number is given even if both the conditions are satisfied)

It has a blank square to its right, and it has no blank square to its left (it has a black square to its left, or it is in the first column). This is the beginning of an Across solution with that number

It has a blank square below it, and no blank square above it (it has a black square above it or it is in the first row). This is the beginning of a Down solution with that number

Constraints

$5 \leq N \leq 15$

$5 \leq M \leq 50$

Input Format

The input consists of two parts, the grid part and the solution part

The first line of the grid part consists of a number, N , the size of the grid (the overall grid is $N \times N$) squares. The next N lines correspond to the N rows of the grid. Each line is comma separated, and has number of pairs of numbers, the first giving the position (column) of the beginning of a black square block, and the next giving the length of the block. If there are no black squares in a row, the pair "0,0" will be specified. For example, if a line contains "2,3,7,1,14,2", columns 2,3,4 (a block of 3 starting with 2), 7 (a block of 1 starting with 7) and 14,15 (a block of 2 starting with 14) are black in the corresponding row.

The solution part of the input appears after the grid part. The first line of the solution part contains M , the number of solutions. The M subsequent lines consist of a sequence of letters corresponding to a solution for one of the Across and Down clues. All solutions will be in upper case (Capital letters)

Output

The output is a set of M comma separated lines. Each line corresponds to a solution, and consists of three parts, the clue number, the letter A or D (corresponding to Across or Down) and the solution in to that clue (in upper case)

The output must be in increasing clue number order. If a clue number has both an Across and a Down solution, they must come in separate lines, with the Across solution coming before the Down solution.

Explanation

Example 1

Input

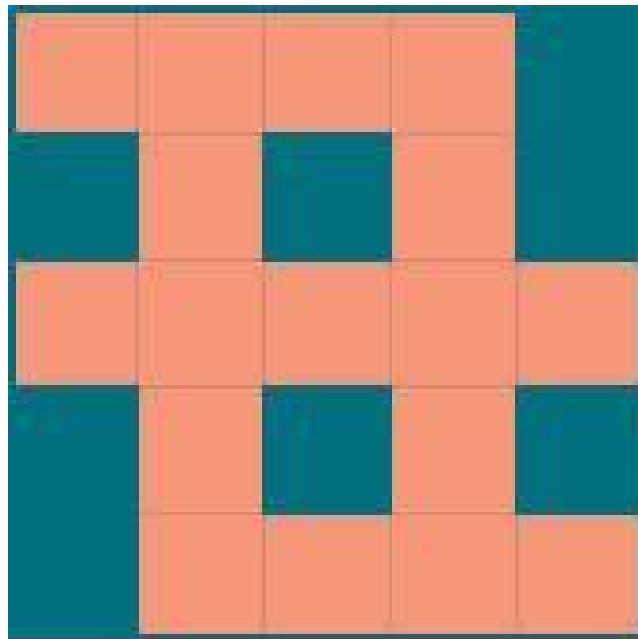
5
5,1
1,1, 3,1, 5,1
0,0
1,1, 3,1, 5,1
1,1
5
EV EN
AC NE
CAL VE
PLE AS
EVA DE

Output

1,A,A CNE
2,D,C ALVE
3,D,E VADE
4,A,P LEAS
5,A,E VEN

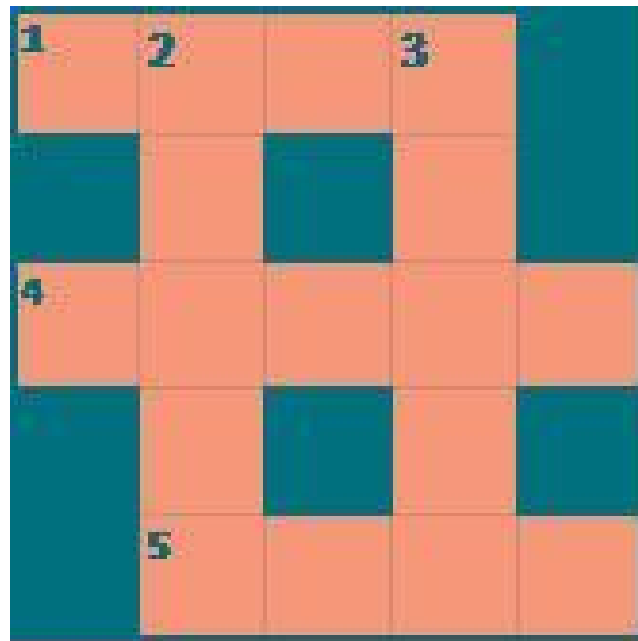
Explanation

N is 5, and the disposition of the black squares are given in the next 5 (N) lines. The grid looks like this

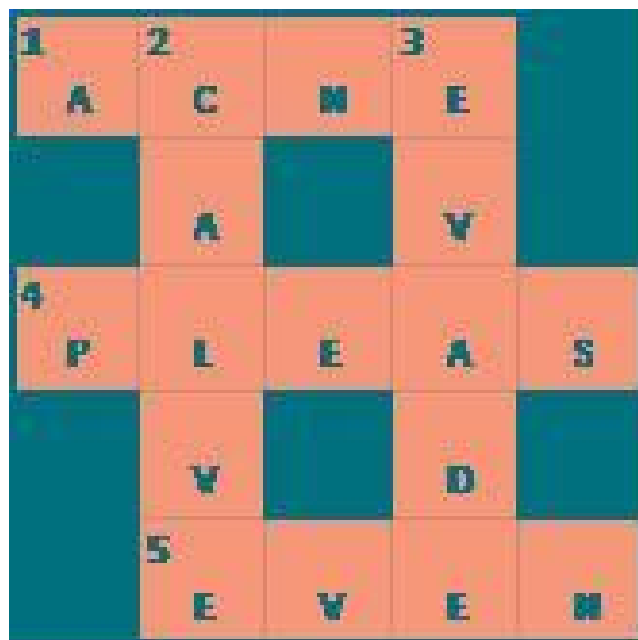


M=5, and there are 5 (M) solutions.

If the grid is numbered according to the rules, the numbered grid looks like this. Note that row 3 has no blanks, and the input line says "0,0"



The solutions are fitted to the grid so that they are consistent, and the result is shown below. Note that this is consistent, because the letter at each intersecting blank square in the Across solution and the Down solution.



Based on this the output is given in clue number order. 1 Across is ACNE, and hence the first line of the output is 1,A,ACNE. The same logic gives all the remaining solutions.

Example 2

Input

5
1, 1
1, 1, 3, 2
0, 0
1, 1, 3, 2
0, 0
5
A S I A N
R I S E N
F E

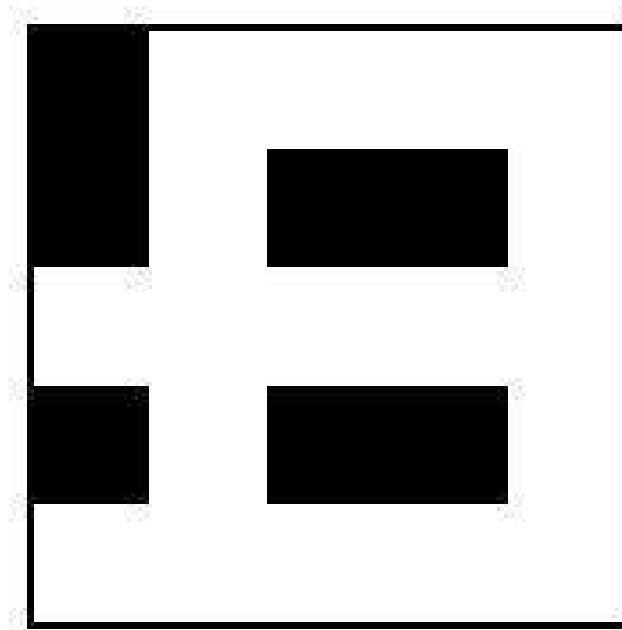
A R
C L A W S
F A L L S

Output

1,A,F EAR
1,D,F ALLS
2,D,RI SEN
3,A,C LAWS
4,A,A SIAN

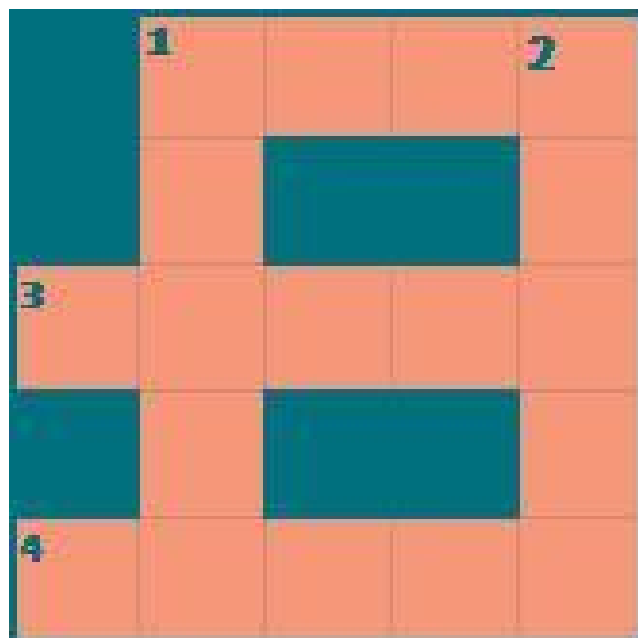
Explanation

N=5, and the grid looks like this

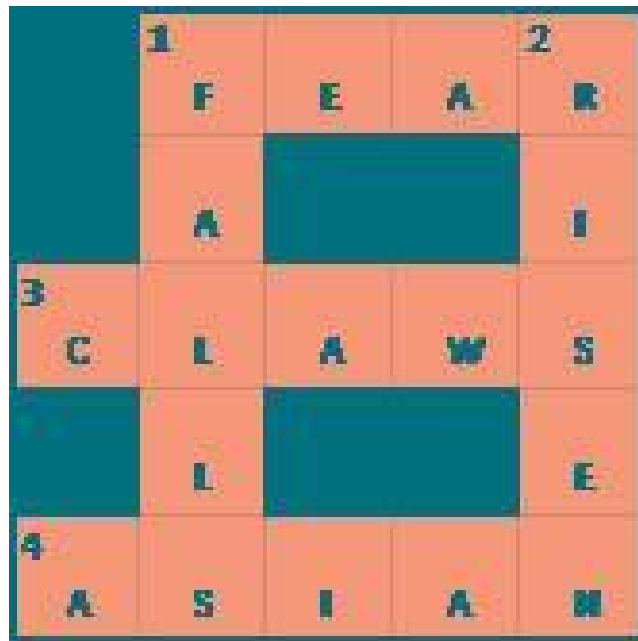


M=5, and the 5 solutions are given

The numbered grid looks like this



The consistently populated grid (with the solutions) look like this



The output can be easily given from this. Note that clue number 1 has both an Across solution (FEAR) and a DOWN solution (FALLS). The Across solution must precede the Down solution in the output.

Question 7.

Given an $M \times N$ matrix, with a few hurdles arbitrarily placed, calculate the cost of longest possible route from point A to point B within the matrix.

Input Format:

1. First line contains 2 numbers delimited by whitespace where, first number M is number of rows and second number N is number of columns
2. Second line contains number of hurdles H followed by H lines, each line will contain one hurdle point in the matrix.
3. Next line will contain point A, starting point in the matrix.
4. Next line will contain point B, stop point in the matrix.

Output Format:

Output should display the length of the longest route from point A to point B in the matrix.

Constraints:

1. The cost from one position to another will be 1 unit.
2. A location once visited in a particular path cannot be visited again.

3. A route will only consider adjacent hops. The route cannot consist of diagonal hops.
4. The position with a hurdle cannot be visited.
5. The values MxN signifies that the matrix consists of rows ranging from 0 to M-1 and columns ranging from 0 to N-1.
6. If the destination is not reachable or source/ destination overlap with hurdles, print cost as -1.

Sample Input and Output

SNo.	Input	Output	Explanation
1	3 10 3 1 2 1 5 1 8 0 0 1 7	24	<p>Here matrix will be of size 3x10 matrix with a hurdle at (1,2),(1,5) and (1,8) with starting point A(0,0) and stop point B(1,7)</p> <p>3 10 3 -- (no. of hurdles) 1 2 1 5 1 8 0 0 -- (position of A) 1 7 -- (position of B)</p> <p>So if you examine matrix below shown in Fig 1, total hops (->) count is 24. So final answer will be 24. No other route longer than this one is possible in this matrix.</p>
2	2 2 1 0 0 1 1 0 0	-1	No path is possible in this 2*2 matrix so answer is -1

Question 8.

Stark is a 10 year old kid and he loves stars. So, he decided every day he will capture a picture of a sky. After doing this for many days he found very interesting observations.

Every day the total number of stars in the sky is same as days completed for a calendar year. He noticed, on Saturday's and Sunday's that there are no stars in the sky. Stark's camera does not have wide angle capture feature so he could only capture maximum of 50 stars at a time. So, he assumed that there are only 50 stars in the sky that day. Also, the camera discharges every 4th

day and he is not be able to click any picture that day. So let's say, if the first day of calendar (01/01/0001) starts on a Monday then on Thursday he can't click any pictures. Then resuming on Friday he can take pictures until Sunday, but can't take picture on Monday, followed by downtime on Friday, then Tuesday, then Saturday etc. When the camera discharges he considers 0 stars that day.

You are his programmer friend and want to help him. You need to write a code which will tell him on a particular date how many stars Stark's camera was able to click.

You can assume Stark has an ancient camera and your first input will be the day for date (01/01/0001) and then followed by any date on which Stark wants to find out the number of stars in the sky.

Input Format:

Every line of input will contain a Day at date 01/01/0001 in dd/mm/yyyy format followed by a Date in the same format (on which we have to count the stars)

Output Format:

For valid Input

Count of the number of stars in the sky on the given date

For Invalid Input

Print "Invalid Date" for invalid date

Print "Invalid Day" for invalid day

Sample Input and Output

SNo.	Input	Output	Explanation
1	Monday 30/02/1990	Invalid Date	
2	Thursday	Invalid Day	

3	Wednesday 24/01/2056	24	Its 24th day of the year and neither is Saturday/Sunday nor has the camera discharged on this day.
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Question 9

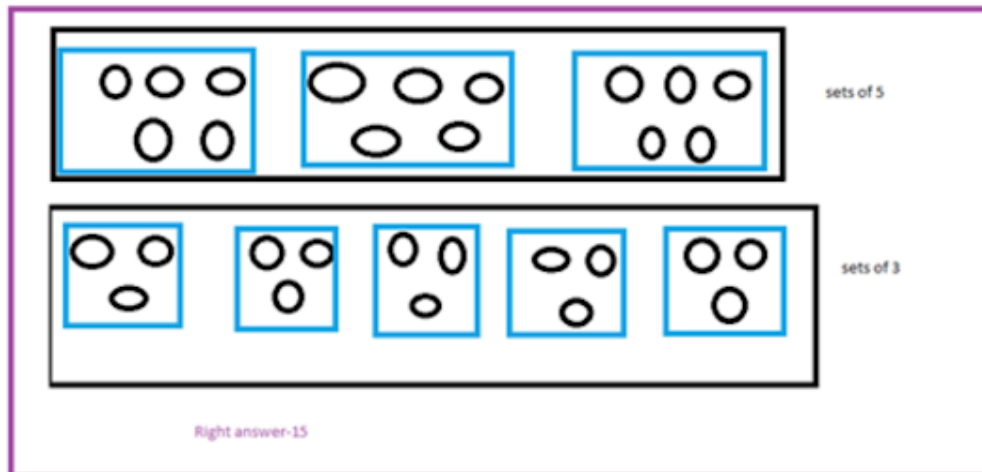
Darrell and Sally are two best friends. They had a large collection of marbles. They devised a game with it to play in their free time which will also help them to improve their math. One of them will have to select a certain number of marbles and give a hint to find the number. The other will have to guess the first number that matches the given criteria and vice versa.

Your task is to act as a judge for this game. When the player finds the answer, you will have to verify the answer. If answer is right, add 10 points to that player. If the player passes the question, you will have to give the right answer (no change in points in this case). You should also announce the winner at the end of the game.

Hint to find the number:

When the marbles are put into a group of x_1 , x_2 , x_3 ,... (where x_1 , x_2 , x_3 can be any number from 1 to 100), it falls into a perfect group. (No marble is left without a group).

Example: - When Darrell says the number falls into a perfect set when she groups them into sets of 3 and 5, the answer could be 15 or 30 and so on. Since the first number that matches the criteria is 15, 15 will be the answer. (Explanation: when 15 marbles is put into groups of 3, We will get 5 sets of 3 marbles each and when it is put into groups of 5, we will get 3 sets of 5 marbles each. For 16 marbles, we will get 5 sets of 3 marbles each and one marble will be left without a proper group. So 16 cannot be the answer)



NOTE: - Please have a look at Sample Input and Output before you read the Input and Output specification

Input Format:

The input will contain

1. Number of input lines N adhering to the following specification
 1. Lines will be of two types either a *Question Posing* line or *Answer Giving* line
 2. Question posing line has to appear before any answer giving line
 3. Question Posing line starts with *Player Name* and Answer Giving line starts with 'A'
2. Second line will be a Question posing line whose format is where Perfect Sets are depicted in the format $<X1$
3. $,X2,...Xn>$ where $2 \leq n \leq 7$ and $1 \leq Xn \leq 100$

Third line must be an *Answer Giving* line which is the answer to the preceding *Question Posing* line. The format of the Answer Giving line is as follows :

1. *answer* above can only be an integer number OR it will be a constant string "PASS"
2. An integer number represents the value of the answer given by the Player
3. If the Player does not know the answer she will "PASS" the question
- 4.
5. Fourth line onwards, if they exist, will be alternating series of Question Posing and Answer Giving lines in case of Valid inputs
6. In case of any Invalid Question Posing line, requisite output must be printed for all previous Valid Question posing line(s).
7. Processing should stop at Invalid input line after printing required message in output. See output specifications and sample test cases to understand points 5) and 6) better

8.

Output Format:

1. First line of output must reiterate the question in the following format < Player Name >'s question is : X1,X2,X3...,Xn>

9.

Second line should be an evaluation of the first *Answer Giving* line of the input. The evaluation message will either be { Correct Answer or Wrong Answer}

10. If the answer

1. is correct, output, : 10points
2. is wrong, output, : 0points
3. is "PASS"-ed by the player,
 1. output "Question is PASSEd"
 2. output "Answer is: " where correct_answer_value is the correct answer for the question passed by the player.
 3. output ": 0points"
4. Overall points collected by players have to be tracked and output when all valid inputs are processed

11. If all inputs are valid, after processing all the inputs, the final output should be comprised of the following 4 lines

1. Output "Total Points:" on fourth last line
2. Output ": points" on 3rd last line, where Player1 is the one who first posed the question
3. Output ": points" on 2nd last line, where Player2 is the one who first answered the question
4. If there is a winner Output "Game Result: is winner" or "Game Result: Draw"

12. Print "Invalid Input" in case of invalid input or failing constraint

13.

Constraints:

1. $0 < N \leq 10$
2. Player Names are Case-sensitive
3. Number of inputs in a Question posing line will be $2 \leq n \leq 7$ and $1 \leq X_n \leq 100$
4. <X1 ,X2,X3...,Xn> can only be integers

14.

Sample Input and Output

SNo.	Input	Output
1	4 Sally 3,5 A Darrell 15 Darrell 4,8 A Sally 8	Sally's question is: 3,5 Correct Answer Darrell: 10points Darrell's question is: 4,8 Correct Answer Sally: 10points Total Points: Sally: 10points Darrell: 10points Game Result: Draw
2	4 Darrell 5,6 A Sally 30 Sally 3,5 A Darrell PASS	Darrell's question is: 5,6 Correct Answer Sally: 10points Sally's question is: 3,5 Question is PASSed Answer is: 15 Darrell: 0points Total Points: Darrell: 0points Sally: 10points Game Result: Sally is winner
3	2 Darrell A Sally 15	Invalid Input
4	4 Sally 3,5 A Darrell 15 Darrell A Sally 15	Sally's question is: 3,5 Correct Answer Darrell: 10points Invalid Input
5	2 Sally 3,5 A Darrell 3	Sally's question is: 3,5 Wrong Answer Darrell: 0points Total Points: Sally: 0points Darrell: 0points Game Result: Draw

6	2 Sally 3,5,15 A Darrell 15	Sally's question is: 3,5,15 Correct Answer Darrell: 10points Total Points: Sally: 0points Darrell: 10points Game Result: Darrell is winner
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Question 10:

Elections are going on, and there are two candidates A and B, contesting with each other. There is a queue of voters and in this queue some of them are supporters of A and some of them are supporters of B. Many of them are neutral. The fate of the election will be decided on which side the neutral voters vote. Supporters of A and supporters of B make attempt to win the votes of neutral voters.

The way this can be done is explained below:

1. The voter queue is denoted by three characters, viz {-, A, B}. The - denotes neutral candidate, A denotes supporter of candidate A and B denotes supporter of candidate B.
2. Supporters of A can only move towards the left side of the queue.
3. Supporters of B can only move towards the right side of the queue.
4. Since time is critical, supporters of both A and B will move simultaneously.
5. They both will try and influence the neutral voters by moving in their direction in the queue. If supporter of A reaches the neutral voter before supporter of B reaches him, then that neutral voter will become a supporter of candidate A.
6. Similarly, if supporter of B reaches the neutral voter before supporter of A reaches him, then that neutral voter will become a supporter of candidate B.
7. Finally, if both reach at the same time, the voter will remain neutral. A neutral vote cannot decide the outcome of the election.
8. If finally, the queue has more votes for candidate A, then A wins the election. If B has more votes, then B wins that election. If both have equal votes, then it will be a coalition government.

Refer Examples section for understanding the dynamics of how the supporters influence the neutral voters.

Your task is to find the outcome of the election.

Note: There are no test cases where all votes are neutral.

Input

First line contains an integer which is length of queue of voters.

Second line contains characters {-, A, B}, in which denotes

· A = voter who is supporter of candidate A

- B = voter who is supporter of candidate B
- — = neutral voter

Output

Print candidate with maximum number of votes. If they have equal number of votes, print "Coalition government".

Examples

Input : 14

—AB—AB—A—

Output : A

Input : 4

A—

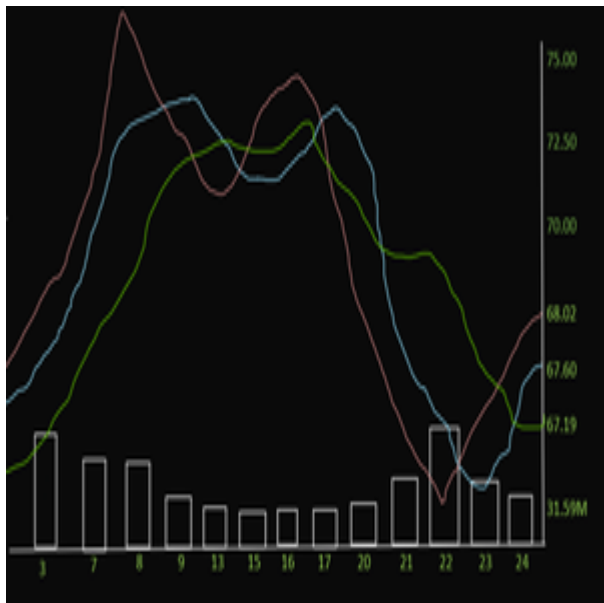
Output : A

Question 11 :

A stock price is dynamic. Its value can change multiple times in a fraction of a second or remain unchanged for several minutes. Analyzing the dynamics of stock price change can provide an indication for forth coming uptrend or downtrend in that stock. One such indicator is simple moving averages. Now, Harry wants to analyze the price trend of the stock on the basis of moving averages (MA).

Let's consider a moving average of 2-day and 4-day respectively. A 2-day moving average is calculated by taking average of closing price of 2 consecutive days. A 4-day moving average is calculated by taking average of closing price of 4 consecutive days. Now, according to experts whenever a faster moving average curve (2-day MA) cuts the slower moving average (4-day MA) from below, then it is an indication of uptrend in the stock. Similarly, whenever a faster moving averages curve (2-day MA) cuts the slower moving average curve (4-day MA) from above, then it is an indication of downtrend in the stock.

Help Harry in computing the number of uptrends and downtrends in the given time for which the data is provided.



In this graph, there are three lines indicating stock closing price, moving average of two days and four days. Now we can see that between 13th and 15th there is an intersection. It is known as a downtrend when the moving average of fewer days is cutting downwards the more days moving average and vice versa.

Note1 – There will be no day1 moving average for 2-day MA. Similarly, there will be no day1, day2, day3 moving average for 4-day MA. In general, there will be no X-1, X-2, Y-1, Y-2, etc. day point for X-day and Y-day moving average curve.

Note2 – All the computation has to be accurate up to 6 digits after the decimal point.

Input

First line contains two space-separated integers which are the moving average days X and Y.

Second line contains an integer N denoting the number of stock prices.

Third line contains N space-separated decimal values denoting the closing price of the stock for N days.

Output

Print the total number of times the stock will give an uptrend or downtrend.

Examples

Input : 3 5

11

4.55 5.4 5.65 5.4 5.2 4.85 4.95 5.05 4.9 4.9 4.95

Output : 3

Input : 2 4

14

69.849998 72.900002 74.449997 77.300003 75.050003 74.349998 75.449997 76.300003 74
69.349998 65.349998 67.349998 67.599998 68.449997

Output : 4

Question 12 :

Aman is a rich businessman who want to build a zoo. He wants to make enclosures for terrestrial and aquatic animals. Terrestrial animals will be of two types, namely herbivorous and carnivorous animals. So there will be three different enclosures.

Herbivores like Elephant, Deer are prime attractions. Similarly, Lion and Tiger are prime attractions amongst carnivores. Finally, Dolphins and Shark are prime attractions amongst aquatics for tourists.

Aman being a savvy businessman realizes that in order to minimize the cost of building the zoo without compromising on the attractions, he has to decide how much area to allocate to each animal type. Each animal type requires a certain area to thrive in. This in turn impacts the area allocation, which in turn has cost implications.

Your task is to help Aman workout the mathematics such that the zoo building cost is minimized subject to the following constraints:

Zoo needs to have minimum of X herbivores, Y carnivores and Z aquatic animals

Different types of animals will need different minimum area to thrive in

For animals of a given type, the minimum area required is the same

There is also a maximum limit for the overall area allocated for each animal type

Cost of fencing etc. is included in cost of enclosure

Exclude the essentials like pathways for tourists, from area and cost calculations

Consider all areas in square meters and cost in Rupees.

Input

First line contains three space separated integers denoting the cost per square meter of building the enclosure for each type of animals viz. herbivorous, carnivorous and aquatic respectively

Second line contains three space separated integers denoting the maximum area that can be allocated to each type of animal viz. herbivorous, carnivorous and aquatic respectively

Next three lines, each will contain two space separated integers M and N, for each type of animal viz. herbivorous, carnivorous and aquatic respectively, where M denotes minimum number of animals of that type and N denotes minimum area required for that animal type

Last line contains an integer which represents the total area of land on which the zoo needs to be built

Output

Single integer containing the minimum cost required to build the zoo.

Examples

Input : 10000 1000 1500

250 250 300

5 5

15 5

10 10

500

Output : 837500

Explanation

- The cost of constructing the enclosure for herbivores is high. However, since we need to accommodate 5 herbivores as per given constraints, a 25 sq. meter land will need to be allocated for the herbivores.
- Since the cost of constructing the enclosure for carnivores is cheapest we are able to allocate them the maximum limit that we can allocate. Thus we are allocating 250 sq. meters for carnivores.
- The remaining 225 sq. meters can thus be allocated to aquatics without violating any constraint.
- Thus the minimum cost of constructing the zoo adhering to all constraints is $(25 * 10000 + 250 * 1000 + 225 * 1500) = 837500$

Example 2

Input : 100 1000 1500

250 250 300

5 5

15 5

10 10

500

Output : 325000

Explanation

· Since the cost of constructing the enclosure for herbivores is cheapest we are able to allocate them the maximum limit that we can allocate. Thus we are allocating 250 sq. meters for herbivores.

· The cost of constructing the enclosure for aquatics is high. However, since we need to accommodate 10 aquatics as per given constraints, a 100 sq. meter land will need to be allocated for the aquatic animals.

· The remaining 150 sq. meters can thus be allocated to carnivores without violating any constraint.

· Thus the minimum cost of constructing the zoo adhering to all constraints is $(250 * 100 + 150 * 1000 + 100 * 1500) = 325000$

For any more doubts and queries , Please comment down in the comment box.