TCS CodeVita Preparation Sheet
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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

Link to Register : https://codevita.tcsapps.com/

Very Important Topics

Maths and Calculation Based
Number Theory
Searching Sorting
2 Pointers Approach
C++ STL , Collection Framework Java
Stacks and Queues
Binary Search
Dynamic Programming
Graphs
Heaps
Recursion
Segment Trees

Resources:

TCS Codevita Coding Ques with Solutions by Campusmonk :
https://youtube.com/playlist?list=PL3JmT-xgOMNwkF_vcHrLKWeiO0_3kww2P&si=l
PNR3OAAWzANPat9

TCS Codevita Coding Ques with Solutions by NG Tutorials :
https://youtube.com/playlist?list=PLPzfPcir5uPTJt84tvdzEN3Cds7k07gSA&si=KEc9k
qoqnY75H1UD

Official Sample Questions by TCS : https://codevita.tcsapps.com/

Previous Year Questions with Solutions (in a systematic way)

https://prepinsta.com/tcs-codevita/practice-questions-with-answers/

https://www.faceprep.in/tcs/tcs-codevita-questions/

https://www.geeksforgeeks.org/tcs-codevita-9-pre-qualifier-round-questions/

Some Important Problems :

Question -:You are given a binary string B of length L which contains K ones and remaining zeros. You are required to place the K ones in the binary string in such a way that the longest consecutive zeros have the least length possible. Once such a binary string is constructed, you are required to print the length of the contiguous block of zeros, which has the largest length.

Constraints

$0 <= K <= L$

$1 <= L <= 10^6$

Input

Single line consisting of two space separated integers denoting L and K.

Output

Print a single integer denoting the length of the longest consecutive zeros as per the problem.

Time Limit (secs)

1

Examples

 Example 1

Input

3 1

Output

1

Explanation

B is of length 3 and it has 1 one's.

So the possible strings as per the problem are 010, 001, 100.

In the first case, the maximum length of consecutive zeros is 1 whereas in the other two cases it is 2. Hence the constructed binary string is 010 and the output is 1.

 Example 2

Input

3 3

Output

0

Explanation

B is of length 3 and it has all three one's. There is no block of zeros, hence the output is 0.

Question -: Consider a set of web pages, numbered from 1 to N. Each web page has links to one or more web pages. Clicking on a link in a page, takes one to the other web page. You are provided numbers of two web pages viz, starting web page and end web page. Your task is to find the minimum number of clicks required to reach the end page from the start page. If end page cannot be reached from start page, print -1 as the output. For better understanding refer *Examples* section.

Constraints

0 < N <= 100

0 < L < 10

Input

First line contains an integer N denoting number of web pages.

Next N lines contain L space separated integers depicting linked webpage number(s) from that webpage

Output

Print the minimum number of clicks required to open the end page from start page. If not possible, print -1 as output.

Time Limit (secs)

1

Example 1

Input

5

2 4

1

1 5

2 3

5

2 3

Output

3

Explanation:

First line conveys that there is total 5 pages.

Second line conveys that there are links from page 1 to pages 2 and 4.

Third line conveys that there is a link from page 2 to page 1.

Fourth line conveys that there are links from page 3 to pages 1 and 5.

Fifth line conveys that there are links from page 4 to pages 2 and 3.

Sixth line conveys that there is a links from page 5 to page 5 itself.

Seventh line conveys that starting page is 2 and ending page is 3

From page 2, we can open only page 1. From page 1, we can open page 4. From page 4, we can open page 3. So, minimum 3 clicks are required, and this is the output.

Example 2

Input

3

2

1

1

2 3

Output

-1

Explanation:

First line conveys that there is total 3 pages.

Second line conveys that there are links from page 1 to page 2.

Third line conveys that there is a link from page 2 to page 1.

Fourth line conveys that there are links from page 3 to page 1.

Since there is no way to reach from page 2 to page 3, print -1 as output.

Question -: A picnic to a famous museum is being planned in a school for class VI. When they reached the spot, the students started quarreling among themselves in the queue. So the teacher came up with an idea of "good string" which is explained below.

Good String is provided as input. All letters in this string are good letters. Good letters need to be used in further computations as explained below.

The teacher asked all the students to convert their names into good names with the help of good string. While converting, they have to calculate the distance. Based on that, she will arrange the students in a queue.

For converting a name into good name, for each letter i in the name, select the nearest letter from the good name. Distance is calculated as the differences between the ASCII values of i and selected good letter. If there are two letters which are equidistant from i, select the letter which is nearest to the previously used good letter. In that case, distance will be the difference of ASCII value of previously used good letter and selected letter. If i is already present in the good string then no need to change it. Initially, previous good letter will be the first letter of good string. Calculate the total distance of the given name.

Given the name of the student who is confused of implementing this task. Help him to calculate the total distance for his name.

Note: Letters from good string can be reused any number of times.

Constraints

1 <= len(good string) <= 100

1 <= len(name) <= 10^4

Good string will consist of lower, upper case alphabets, digits and symbols.

Name will consist of only space, lower and upper case alphabets.

Characters are case sensitive.

The ASCII values for all the characters in the good string and name will be between 32 to 126 (both inclusive).

Input

First line consists of good string.

Second line consists of the name of the student who is confused to implement the task.

Output

Print the total distance for that name.

Time Limit (secs)

1

Examples

Example 1

Input

(@HR*i{kcQl

Vyom

Output

10

Explanation

i

Previous good letter

Current good letter for i

V

(

R

y

R

{

o

{

l

m

l

l

The total distance will be |ASCII(V)-ASCII(R)| + |ASCII(y)-ASCII({)| + |ASCII(o)-ASCII(l)| + |ASCII(m)-ASCII(l)| = 4+2+3+1 = 10.

Example 2

Input

6*K4AQf]gpi

Nainika

Output

33

Explanation

i

Previous good letter

Current good letter for i

N

6

K

a

K

]

i

_

_

n

]

p

i

_

_

k

p

i

a

i

]

Initially, Previous good letter=6. Since K and Q are at the same distance from N, so we select the character which is nearest to previous letter(6) which is K.

i is already present in the good string. So no need to change anything.

Therefore, total distance will be |ASCII(6)-ASCII(K)| + |ASCII(a)-ASCII(])| + |ASCII(n)-ASCII(p)| + |ASCII(k)-ASCII(i)| + |ASCII(a)-ASCII(])| = 21+4+2+2+4 = 33.

Question -: A math game is introduced in a school competition to test the skills of students. The game deals with Prime numbers.
The game rules are as follows:

- From the given set of distinct natural numbers as input, consider the smallest natural number as q.
- Your task is to compute the smallest prime number (p) such that when p is divided by all the distinct numbers in the input, except q, should result q as the remainder.

Constraints :

- $1 < n < 11$
- $p < 10 ^ 10$

Input :

Input consists of n+1 number of distinct natural numbers separated by spaces.

Output :

Print single integer p if such a p exists, else print "None".

Time Limit : 1 secs

Example 1 :

Input :

4

3 4 5 1

Output : 61

Explanation : Here the n+1 numbers are 3, 4, 5 and 1 where q=1 (the least of the numbers)

The smallest number that leaves remainder 1 when divided by 3, 4 and 5 is 61 and is prime. Hence, output is 61.

Example 2 :

Input :

4

3 4 5 2

Output : None

Explanation : Here q=2. Any number that when divided by 4 leaving remainder 2 must be an even number e.g., 6, 10, 14 etc. Hence it can't be prime. Hence, output is "None".

Question -: Consider a Jug of capacity L liters. Given N cups of different capacities Ci (in liters), fill the Jug with the help of cups, according the specification.
The specification according to which the cups may be used to fill the Jug is as below

1. Cups can be used integral number of times i.e., zero or more times, but never partially i.e., a cup of 1L can be used 0, 1, 2 etc. times, but never 0.5, 1.5, 2.5 .. times

2. The Jug must not overflow because of cup filling the Jug

3. The number of distinct cups (i.e., different cup sizes) used to fill the Jug must be maximized

4. The summation of number of times all cups are used must be minimized.

5. Consider point 3 to be more important than point 4 when meeting the optimisation goals.

For better understanding of how cups can be used to fill the Jug, go through the *Examples* section. Both examples clearly explain, when there are multiple ways to achieve the objective, what is the correct answer and why.

Constraints :

$0 < N < 10$

$0 < L <= 100$

$0 < Ci < L$

Input :

First line contains an integer N denoting the number of cups available.

Second line contains N space separated integers denoting the capacity of the cups.

Third line contains an integer L which denotes the capacity of Jug in liters.

Output :

Output consists of two lines.

First line must comprise of N or less space delimited integers, in ascending order of cup size, for the cups used to fill the Jug

Second line must comprise of equal number of space delimited integers which denote the frequency i.e. the number of times the corresponding cup in first line is used to fill the Jug.

Time Limit : 1 sec

Example 1 :

Input :

4

3 7 10 11

88

Output :

3 7 10 11

1 2 6 1

Explanation :

The first and second lines indicate that you are provided with 4 cups of capacities – 3 liters, 7 liters, 10 liters and 11 liters. The third line indicates that the capacity of the Jug is 88 liters.

One possible solution for filling the Jug is

7 10 11

5 2 3

i.e., one can use 7L cup for 5 times to get 35L. Next one can use the 10L cup twice. After that the Jug will contain 55L. Finally, one can use 11L cup thrice. Thus, the Jug will be filled. However, this solution uses cups of only 3 different capacities when 4 different capacities are available. Hence the Jug is perhaps not filled according to the specification. Let's see if we can achieve our objective by using all 4 cup sizes.

We can use all the available cups if we use them as follows

3 7 10 11

1 2 6 1

Hence, this is our final solution which adheres to the specification.

Example 2 :

Input :

3

2 5 10

50

Output :

2 5 10

5 2 3

Explanation :

The first and second lines indicate that you are provided with 3 cups of capacities – 2 liters, 5 liters, 10 liters. The third line indicates that the capacity of the Jug is 50 liters.

Here one can easily fill the Jug by using the 10L cup 5 times. However, this does not obey the specifications. According to the specifications, one must use all available cups of capacity 2L, 5L and 10L. If there are multiple ways in which the Jug can be filled by using maximum number of distinct sized cups, then as per specifications one needs to minimize the summation of number of times cups are used.

Consider the following solutions :

Solution 1

2 5 10

15 2 1

Solution 2

2 5 10

5 2 3

Both solutions use all available cups. However, sum of frequencies in Solution 1 is 18 (15 + 2 + 1), whereas sum of frequencies in Solution 2 is 10 (5 + 2 + 3). Solution 2 minimizes the summation of number of times any cup in used. This is also a requirement as per the specification. Hence Solution 2 is the correct answer.

Question . 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*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

$2 <= N,M <= 10^2$

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 . 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 ith of the next q lines contains character d[i] denoting direction and integer r[i] denoting the magnitude.

Constraints

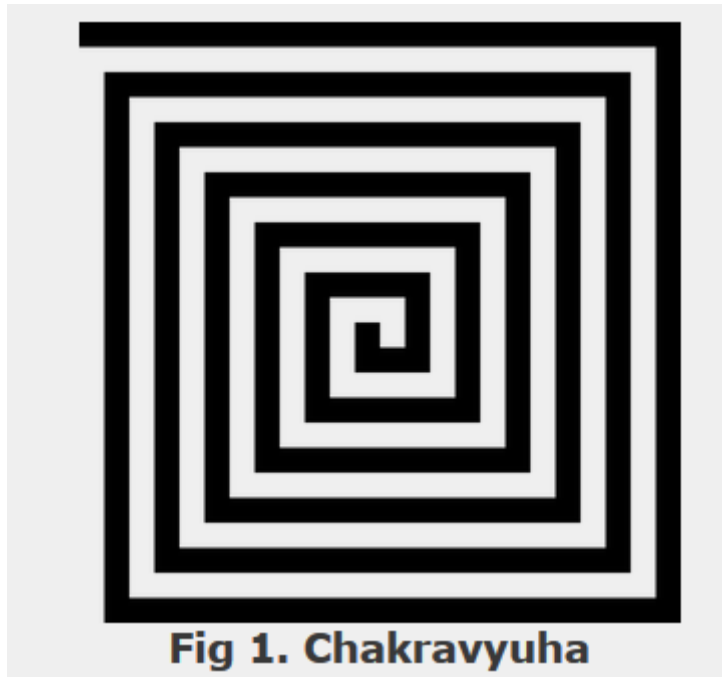1 <= Length of original string <= 30

1<= q <= 10

Output

YES or NO

Question
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 Yudhisthir 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, Yudhisthir 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

Fig 1. Chakravyuha

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 a 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 <=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 = loanAmount * monthlyInterestRate /

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

Constraints

1 <= P <= 1000000

1 <=T <= 50

1<= N1 <= 30

1<= N2 <= 30

Input Format

First line : P – principal (Loan Amount)

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

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

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

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

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

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

Output

Your decision – either Bank A or Bank B.

Explanation

Example 1

Input

10000

20

3

5 9.5

10 9.6

5 8.5

3

10 6.9

5 8.5

5 7.9

Output

Bank B

Example 2

Input

500000

26

3

13 9.5

3 6.9

10 5.6

3

14 8.5

6 7.4

6 9.6

Output

Bank B

Question .

Given an MxN 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	Explaination

1			
	3 10 3 1 2 1 5 1 8 0 0 1 7	24	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) 3 10 3 -- (no. of hurdles) 1 2 1 5 1 8 0 0 -- (position of A) 1 7 -- (position of B) 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.
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 .

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.

Question

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.
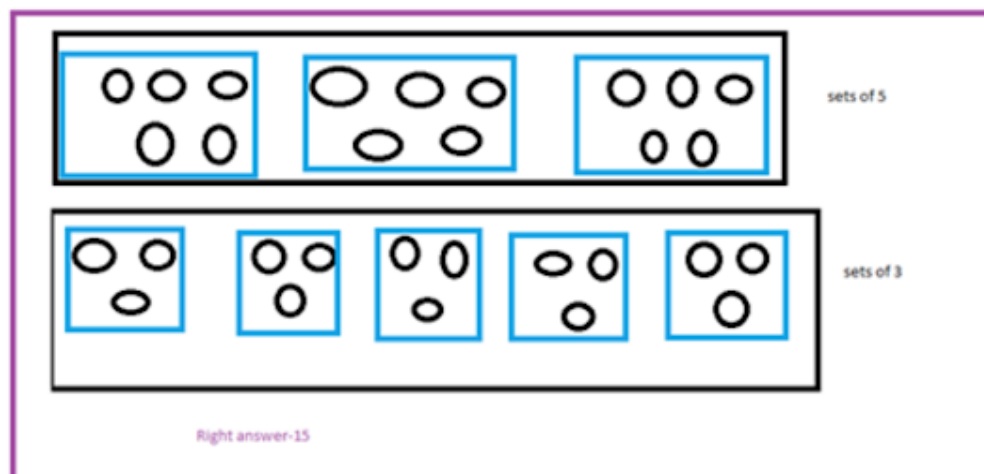
Your task is to act as a judge for this game. When the player finds the answer, you will have to verify the answer. If answer is right, add 10 points to that player. If the player passes the

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 x1, x2, x3,...(where x1, x2, x3 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<=n<=7 and 1<=Xn<=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 <= 10
2. Player Names are Case-sensitive
3. Number of inputs in a Question posing line will be 2<=n<=7 and 1<=Xn<=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

Question :

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–
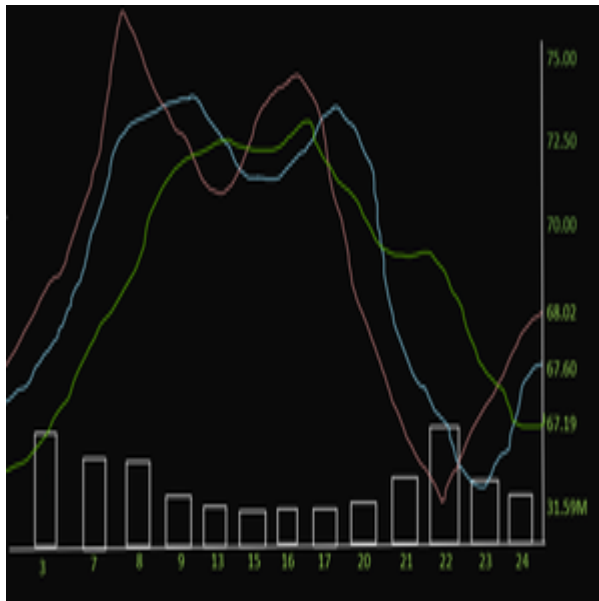

Output : A

Input : 4

A—

Output : A

Question :

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 downtrend when 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 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 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 :

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 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 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