Q1: Passwords

You have developed an e-commerce website. Many people have created accounts on your website. You have the passwords of all the users. You want to know how many distinct passwords are there in total.

Details of a password are as described:
- Each password is a string of characters from a to z (small letters).
- Two passwords, say Pass1 and Pass2, are said to be the same if Pass2 can be obtained by swapping the ith character with the jth character in Pass1, where $(i+j)\%2=0$.

Note: Swapping can be done repeatedly.

Input Specification:

input1: N, number of users registered

input2: An array of strings containing all the passwords of the N users

Output Specification:

Return T, the total number of distinct passwords present.

Example 1:

input1: 2

input2: {abcd,cdab}

Output: 1

Explanation :

"cdab" can be obtained from "abcd" by swapping 0_{th} and 1_{st} elements with 2_{nd} and 3rd elements respectively. Hence, only 1 distinct password.

Example 2:

input1: 2

input2: {abcd,bcad}

Output: 2

Explanation :
"bcad" cannot be obtained from "abcd" under the given conditions. Hence, 2 distinct passwords.

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Q2: Interns

A company has hired N interns, labeled from 1 to N. Each intern is given a device which generates a number everyday that will be used as a password for their authentication at the office door every day in the morning. The internship is for 50 days numbered from 0 to 49. Initially (on the 1st day), the number in the device of the kth intern will be equal to (5000*k).

From the 2nd day (i.e., i=1), a new number will be generated every day in each device in the following way:

- Day(i)= Day(i-1) + 5000 + i

Find the label of an intern from the given password used by him/her.

Input Specification:

input1: N, number of interns

input2: P, password used

Output Specification:

Return the label of the intern to whom the given password belongs to.

Example 1:

input1: 2

input2: 5000

Output: 1

Explanation:
5000 is the number of the first intern on day 0.

Example 2:

input1: 10

input2: 25003

Output: 3

Explanation:
15000 is the number of the third intern on day 0. 20001 is the number of the third intern on day 1. 25003 is the number of the third intern on day 2.

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Q.3: Love Letter

You write a love letter to your friend. However, before your friend can read it, someone else takes it and rotates the characters of each word left to right K times. Find the number of words that remain the same even after this shifting of letters.

Note: There can be more than one spaces between the words.

Input Specification:

input1: String of words

input2: K, number of times rotation happens

Output Specification:

Your function should return the number of correct words.

Example 1:

input1: llohe ereth

input2: 2

Output: 0

Explanation:
In example 1, "llohe ereth" is a rotated string. Hence, the original string was "hello there" which is not correct. Hence answer is 0.

Example 2:

input1: adaada

input2: 3

Output: 1

Explanation:
In example 2, "adaada" when rotated 3 times, gives back "adaada". Hence answer is 1.

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Q.4: Computer Networks

In network topologies under Computer Networks, there are three types of topologies: Bus topology, Ring topology and Star topology.

You are given a dataset that has several caselets (each caselet represents a topology) and each caselet has several lines.
1. A value 'N' denoting the number of nodes in the topology.
2. A value 'M' denoting the number of connections in the topology.
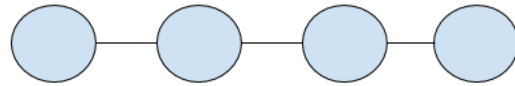3. 'M' lines denoting which two nodes are connected.

You need to find which caselet represents which topology.
1. Return 1 if the caselet is a bus topology.
2. Return 2 if it is a star topology
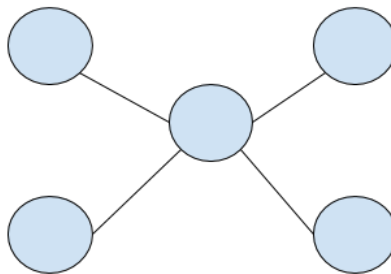3. Return 3 if it is ring topology

4. Return -1 otherwise
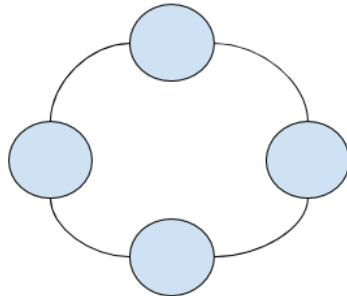
Ring Topology

Bus Topology

Star Topology

Input Specification:

input1: The value N

input2: The value M

input3: Array of size M containing the starting point of the connections

input4: Array of size M containing the end point of the connections

Output Specification:

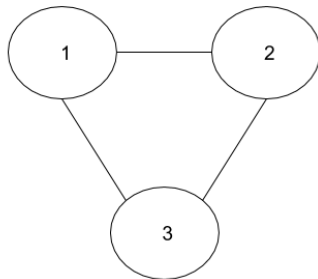Return the type of topology the network represents.

Example 1:

input1: 3

input2: 3

input3: {1,2,3}

input4: {2,3,1}

Output: 3

Explanation:
It represents a ring topology.

Example 2:
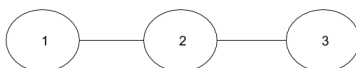
input1: 3

input2: 2

input3: {1, 2}

input4: {2, 3}

Output: 1

Explanation:
It represents a bus topology.

//Q.5: Cryptic tree

Sherlock received a strange case that had an interesting twist .The murderer had placed the victim's body on the top of a tree. The tree was a special one with its roots at the top and leaves at the bottom. As any crime is not perfect, this murderer had left a series of clues in the leaves and the nodes of the tree. The clues were a series of numbers present at the leaves and nodes starting from the bottommost leaves and moving up one by one and Sherlock has to find them and crack them in order to solve the crime. You have to help Sherlock crack the puzzle.

You are given the set of numbers, but in two of the following different ways:

1. Such that the root is between its children
2. Such that the root is before its children

Input Specification:

input1: The number array representing the values in the 1 st way

input2: The number array representing the values in the 2 nd way

input3: Size of the array

Note: In the case where the body is not on the tree, the tree can be empty too.

Output Specification:

The array giving the correct sequence of numbers as desired for solving the puzzle.
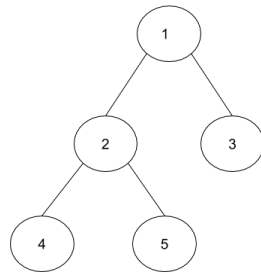
Example 1:

input1: {4,2,5,1,3}

input2: {1,2,4,5,3}

input3: 5

Output: {4,5,2,3,1}

Explanation:

and the traversal according to the question will be {4,5,2,3,1}.

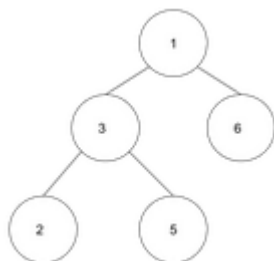**Example 2:**

input1: {2,3,5,1,6}

input2: {1,3,2,5,6}

input3: 5

Output: {2, 5, 3, 6, 1}

Explanation:
The tree here is:

and the traversal will be {2,5,3,6,1}.

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Q6: Starting Points

On the way to Tracy's coaching center and her home, there are exactly N bus stops. These are numbered from 1 (coaching center) and N (Tracy's home). The number of buses that can be boarded from each bus stop is also given.

A bus will only stop at a bus stop whose number is a multiple of the bus stop number from which the bus originates.

Find the number of buses originating from each bus stop between her coaching center and her home.

Input Specification:

input1: N, total number of bus stops, $N<=10^4$

input2: Array of N elements: Bus[ ], Bus[i]=Number of buses that can be boarded from

$(i+1)^{th}$ stop, Bus[i]<=100

Output Specification:

Return an array of N elements: Result[ ], Result[i]=Number of buses originating from

$(i+1)^{th}$ stop

Example 1:

input1: 3

input2:{1,2,3}

Output: {1,1,2}

Explanation:

1 bus originates from the 1st bus stop and stops at all the bus stops. Hence, the number of buses originating from the 2nd bus stop = 2-1=1; buses from the 2nd bus stop will not stop at the 3rd bus stop. Hence, number of buses originating from the 3rd bus stop =3-1(bus from 1st bus stop)=2.

Example 2:

input1: 2

input2: {2, 7}

Output: {2, 5}

Explanation:
2 buses originate from the 1st bus stop and stop at the second bus stop. Hence, the number of buses originating from the 1st bus stop is 7 - 2 = 5.

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Q7: Line

At the ticket counter of a movie theater, N people labeled from 1 to N are initially standing in a queue, such that the first person in the front of the queue is 1.

The following events are taking place at any given time:
E1: The person standing in the front of the queue gets the ticket and moves out.
E2: A person X gets annoyed standing in the queue and moves out of the queue.

The following query needs to be answered:
E3: At the given time, what is the position of the person X?

Input Specification:

input1: N, the number of people initially standing in the queue

input2: Q, the number of queries

input3: An array of Q elements, each having the following elements: E, X.

If E = 1, then event E1 occurs (Assume the value of X to be 0 with this event)

If E = 2, then event E2 occurs.

If E = 3, you need to find the position of the person X.

Output Specification:

Your function should return the number which is the sum of all the E3
queries.

Example 1:

input1: 5

input2: 1

input3: {{1,0}}

Output: 0

Explanation:

There are no queries of type E3, so the output is 0.

Example 2:

input1: 5

input2: 3

input3: {{1,0}, {3,3}, {2,2}}

Output: 2

Explanation:

- The first person in the queue moves out.
- The position of the person labeled 3 is now 2nd.
- The person labeled 2 moves out of the queue.

So, output is 2.
*

Q8: Social Network

In a particular social network friends are automatically allocated to users by the system and users cannot add friends of their choice on their own. There are currently N users on the social network, labeled from 2 to N + 1.

For every ith user (where i ranges from 2 to N + 1), the system allocated all the users labeled with multiples of i as the user's friends (if possible).

One day, all users of the social network come together for a meeting and form groups such that each person in a group is a direct friend or a friend of a friend of every other person of that group.

Find the total number of groups.

Input Specification:

input1: N, denoting the number of users on the social network

Output Specification:

Your function should return the number of groups that can be formed on the given conditions

Example 1:

input1: 5

Output: 2

Explanation :

Two groups will be formed:
2, 3, 4, 6
5

Example 2:

input1: 10

Output: 3

Explanation :

Three groups will be formed:
2, 3, 4, 5, 6, 8, 9, 10
7
11

*

Q9: Documents

The United Nations Organization released an official document regarding the most important events from the beginning of time (dated 00-00-0000) with a brief description of the events. The date of all the events is mentioned in the 'DD-MM-YYYY' format.

Find the total number of distinct years referenced in the document.

Input Specification:

input1: String containing the content of the document

Output Specification:

Return the total number of distinct years referenced in the document.

Example 1:

input1: UN was established on 24-10-1945. India got freedom on 15-08-1947.

Output: 2

Explanation :
2 distinct years, 1945 and 1947 have been referenced.

Example 2:

input1: Soon after World War 2 ended on 02-09-1945, the UN was established on

24-10-1945.

Output: 1

Explanation :
Only 1 distinct year, i.e., 1945 has been referenced.

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Q10: Coding Marathon

N number of people participated in a coding marathon where they were asked to solve some problems. Each problem carried 1 mark and at the end of the marathon, the total marks that each person achieved was calculated.

As an organizer, you have the list of the total marks that each person achieved. You have to calculate the sum of the marks of top K scorers from the list.

Input Specification:

input1: N, Total number of participants

input2: K, Top scorers

input3: An array of length N with the scores of all N participants

Output Specification:

Return S, sum of the marks of top K scorers from the list.

Example 1:

input1: 4

input2: 2

input3: {4,1,2,5}

Output: 9

Explanation:
Top 2 scores are 5 and 4. Sum= 5+4=9.

Example 2:

input1: 4

input2: 3

input3: {4,3,6,1}

Output: 13

Explanation:
Top 3 scores are 6, 4 and 3. Sum= 6+4+3=13.

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Recursion Problems

Q1: Food Country

Samir has arrived in a new country for the first time. He is very hungry and is fascinated by the strange type of food service in the country but needs to be careful at the same time.
The Food Service in the country is as follows:

- Food is served as a buffet arranged in a (N*M) array.

- There are K types of food(s) available in the country.

- One has to start from the index (0,0) of the array and eat all the food that comes in the

    way to reach the index (n,m) of the array.\

- The index (i,j) of the array represents the type of food.

A complete path from index (0,0) to (n,m) of the array is considered as a meal. A meal can be of two types, **good** or **bad**. He defines a meal to be "good" if it contains at least two food items of the same type. He is allowed to divide a meal into sections. A meal can be divided into various good

meal sections where a single good meal section involves at least two food items of the same type. Since Samir is very health conscious and does not want to have different types of foods in his meal, he asks you to divide the meal into maximal good meals sections.

You are required to return :

1. The maximum number of good meal sections possible in a single meal among all the possible meals.

2. The number of meals with maximum number of good meals sections in it.

Input Specification:

input1: An integer value K denoting the types of food(s)

input2: An integer value N denoting the number of rows in input4 array

input3: An integer value M denoting the number of columns input4 array

input4: A 2-D integer array of the dimension (N*M) representing the food buffet.

Output Specification:

Your function should return two integers:

output1: An integer denoting the maximum number of good meal sections possible in a single meal among all the possible meals.

output2: An integer denoting the number of meals with maximum number of good meals sections in it.

Example 1:

input1: 2

input2: 2

input3: 2

input4: {{1, 1}, {2, 1}}

output1: 1

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output2: 2

Explanation:
The total possible meals are:
1 2 1
1 1 1

The above mentioned are the total possible meals available while traversing from (0,0) to (1,1).

Since both the meals have only a maximum of 1 good meal section possible which contains at least 2 foods of the same type i.e (food 1).

Thus, 1 i.e the maximum number of good meals sections possible will be returned as **output1** and 2 i.e the number of all meals possible having the maximum number of good meals sections in them will be returned as **output2**.

Example 2:

input1: 3

input2: 3

input3: 3

input4: { {1, 1, 1}, {2, 2, 3}, {2, 2, 3} }

output1: 2

output2: 4

Explanation:
Possible Meals:
1 2 2 2 3
1 2 2 3 3
1 1 2 2 3
1 1 2 3 3
1 1 1 3 3

Out of the above 5 possible meals, the meal number 2,3,4 and 5 each have 2 good meals sections in them having 2 such food items being consumed twice.

So, 2 being the maximum number of good meal sections possible among all the meals will be returned as **output1** and 4 being the number of meals with maximum number of good meals sections in it, will be returned as **output2**.

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Q2: Machines

Samuel owns a shoe factory where there are N different machines operated for N different purposes. Each machine has its own motor. In order to avoid resonance, the rotation speed of any 2 machines should at least differ by 2 units. The rotation speed can only be in integer units and the maximum rotation speed of any motor is X units. GIven minimum rotation speed of any motor to be 1 unit, you have to help Sam find out the number of different ways he can configure the speed of the motors.

Input Specification:

input1: N, denoting the number of machines.

input2: X, denoting the maximum speed of the motor.

Output Specification:

Your function should return the total number of configuration modulus 10^4.

Example 1:

input1: 2

input2: 3

Output: 2

Explanation:
Possible configurations are: (1, 3), (3, 1).

Example 2:

input1: 3

input2: 6

Labs

Output: 24

Explanation:
Possible Configurations are (1, 3, 5), (1, 3, 6), (1, 4, 6), (2, 4, 6) and combinations of those. Hence output is 24