TCS CodeVita Questions | Previous Year Questions & Solutions

Important topics

Here are some of the most asked concepts/questions in TCS CodeVita. Have a look at them and start solving them now.

Important Topics
Max Flow Problem
Segment Trees
Bit-masking Dynamic Programming
Pattern matching and Pattern searching : Z algorithm, Rabin-Karp algorithm, KMP algorithm
Depth First Search and Breadth-First Search
Dijkstra, Kruskal
Coin Sum
Subset Sum
Knapsack
Min Cost Path
DFS with memorization
DFS in matrices

TCS CodeVita Questions

Here are some of the TCS CodeVita questions from previous year's papers with detailed solutions.

TCS CodeVita Questions #Q1

Constellation

Three characters { #, *, . } represents a constellation of stars and galaxies in space. Each galaxy is demarcated by # characters. There can be one or many stars in a given galaxy. Stars can only be in the shape of vowels { A, E, I, O, U }. A collection of * in the shape of the vowels is a star. A star is contained in a 3x3 block. Stars cannot be overlapping. The dot(.) character denotes empty space.

Given 3xN matrix comprising of { #, *, . } character, find the galaxy and stars within them.

Note: Please pay attention to how vowel A is denoted in a 3x3 block in the examples section below.

Constraints

3 <= N <= 10^5

Input

Input consists of a single integer N denoting the number of columns.

Output

The output contains vowels (stars) in order of their occurrence within the given galaxy. The galaxy itself is represented by the # character.

<u>Example 1</u>

Input

```
18

* . * # * * * # * * * # * * * . * .

* . * # * . * # . * . # * * * * * *

* * * # * * * # * * * # * * * * * . *
```

Output

```
U#O#I#EA
```

Explanation

As it can be seen that the stars make the image of the alphabets U, O, I, E, and A respectively.

<u>Example 2</u>

Input

```
12

* . * # . * * * # . * .

* . * # . . * . # * * *

* * * # . * * * # * . *
```

Output

```
U#I#A
```

Explanation

As it can be seen that the stars make the image of the alphabet U, I, and A.

Possible solution:

Input:

```
12

* . * # . * * * # . * .

* . * # . . * . # * * *

* * * # . * * * # * . *
```

C++

```
#include <iostream>
using namespace std;
int main()
{
	int n,x1,y1;
	cin>>n;
	char x[3][n];
	for(int i=0;i<3;i++)
	{
		for(int j=0;j<n;j++)
		{
		cin>>x[i][j];
	}
	}
	for(int i=0;i<n;i++)
	{
	if(x[0][i]=='#' && x[1][i]=='#' && x[2][i]=='#')
		{
		cout<<'#';
		}
			else if(x[0][i]=='.' && x[1][i]=='.' && x[2][i]=='.')
			{}
			else
			{
			char a,b,c,a1,b1,c1,a2,b2,c2;
			x1 = i;
			a = x[0][x1];
			b = x[0][x1+1];
			c = x[0][x1+2];
			a1 = x[1][x1];
			b1 = x[1][x1+1];
			c1 = x[1][x1+2];
			a2 = x[2][x1];
			b2 = x[2][x1+1];
			c2 = x[2][x1+2];
			if(a=='.' && b=='*' && c=='.' && a1=='*' && b1=='*' && c1=='*' &&
a2=='*' && b2=='.' && c2=='*')
				{
				cout<<"A";
				i = i + 2;
			}
			if(a=='*' && b=='*' && c=='*' && a1=='*' && b1=='*' && c1=='*' &&
a2=='*' && b2=='*' && c2=='*')
				{
				cout<<"E";
				i = i + 2;
			}
			if(a=='*' && b=='*' && c=='*' && a1=='.' && b1=='*' && c1=='.' &&
a2=='*' && b2=='*' && c2=='*')
				{
				cout<<"I";
				i = i + 2;
			}
			if(a=='*' && b=='*' && c=='*' && a1=='*' && b1=='.' && c1=='*' &&
a2=='*' && b2=='*' && c2=='*')
				{
				cout<<"O";
				i = i + 2;
			}
			if(a=='*' && b=='.' && c=='*' && a1=='*' && b1=='.' && c1=='*' &&
a2=='*' && b2=='*' && c2=='*')
				{
				cout<<"U";
				i = i + 2;
			}
		}
		}
}
```

OUTPUT
U#I#A

Java 8

```
import java.util.*;
public class Main {
    public static void main(String[] args) throws Exception {
        // Your code here!
        Scanner sc=new Scanner( System.in );
        int n=sc.nextInt();
        char gal[][] = new char [3][n];
        for(int i=0;i<3;i++){
            String a=sc.next();
            for(int j=0;j<n;j++)
            gal[i][j]=a.charAt(j);
        }
        for(int i=0;i<n;)
        {
            if(gal[0][i]=='#')//||gal[0][i+1]=='#')
            {
                System.out.print("#"); i++; continue;
            }
            if(gal[0][i]=='.' && gal[1][i]=='.' && gal[2][i]=='.')
            {
                i++; continue;
            }
            if(gal[0][i]=='.' && gal[0][i+2]=='.' && gal[2][i+1]=='.')
            System.out.print("A");
            else if(gal[1][i+1]=='.')
            {
                if(gal[0][i+1]=='.')
                System.out.print("U");
                else
                System.out.print("O");
            }
            else if(gal[1][i]=='.' && gal[1][i+2]=='.')
            System.out.print("I");
            //else if(gal[0][i]=='#')
            //System.out.print("#");
            else
            System.out.print("E");

            i+=3;
        }
        // System.out.println("XXXXXXXX");
    }
```

OUTPUT

```
U#I#A
```

Python

```
from collections import deque
def initialize():
    q = deque()
    # A
    s = ""
    q.append(['.', '*', '*'])
    q.append(['*', '*', '.'])
    q.append(['.', '*', '*'])
    s = ''.join(map(str, q))
    vowels[s] = 'A'
    q.clear()
    #E
    q.append(['*', '*', '*'])
    q.append(['*', '*', '*'])
    q.append(['*', '*', '*'])
    s = ''.join(map(str, q))
    vowels[s] = 'E'
    q.clear()

    #I
    q.append(['*', '.', '*'])
    q.append(['*', '*', '*'])
    q.append(['*', '.', '*'])
    s = ''.join(map(str, q))
    vowels[s] = 'I'
    q.clear()
    #O
    q.append(['*', '*', '*'])
    q.append(['*', '.', '*'])
    q.append(['*', '*', '*'])
    s = ''.join(map(str, q))
    vowels[s] = 'O'
    q.clear()
    #U
    q.append(['*', '*', '*'])
    q.append(['.', '.', '*'])
    q.append(['*', '*', '*'])
    s = ''.join(map(str, q))
    vowels[s] = 'U'
    q.clear()
     return vowels
vowels = {}
vowels = initialize()
n = int(input())
x = []
for i in range(n):
    x.append(['.', '.', '.'])
for i in range(3):
    l = []
    l = list(input())
    for j in range(n):
        x[j][i] = l[j]

constellation = ""
star = deque()
for i in range(n):
    if len(star) ==3:
        s = ''.join(map(str, star))
        if s in vowels:
            constellation += vowels[s]
            star.clear()
        else:
            star.popleft()
    if x[i]==['#', '#', '#']:
        star.clear()
        constellation += '#'
        continue
    star.append(x[i])
if len(star)==3:
    s = ''.join(map(str, star))
    if s in vowels:
        constellation += vowels[s]

print(constellation, end="")
```

OUTPUT

```
U#I#A
```

TCS CodeVita Questions #Q2

<u>**Prime Time Again**</u>

Here on earth, our 24-hour day is composed of two parts, each of 12 hours. Each hour in each part has a corresponding hour in the other part separated by 12 hours: the hour essentially measures the duration since the start of the daypart. For example, 1 hour in the first part of the day is equivalent to 13, which is 1 hour into the second part of the day.

Now, consider the equivalent hours that are both prime numbers. We have 3 such instances for a 24-hour 2-part day:

5~17

7~19

11~23

Accept two natural numbers D, P >1 corresponding respectively to a number of hours per day and the number of parts in a day separated by a space. D should be divisible by P, meaning that the number of hours per part (D/P) should be a natural number. Calculate the number of instances of equivalent prime hours. Output zero if there is no such instance. Note that we require each equivalent hour in each part in a day to be a prime number.

Example:

Input: 24 2

Output: 3 (We have 3 instances of equivalent prime hours: 5~17, 7~19, and 11~23.)

Constraints

10 <= D < 500

2 <= P < 50

Input

The single line consists of two space-separated integers, D and P corresponding to the number of. hours per day and number of parts in a day respectively

Output

Output must be a single number, corresponding to the number of instances of equivalent prime number, as described above

<u>Example 1</u>

Input

36 3

Output

2

Explanation

In the given test case D = 36 and P = 3

Duration of each daypart = 12

2~14~X

3~15~X

5~17~29 - an instance of equivalent prime hours

7~19~31 - an instance of equivalent prime hours

11~23~X

Hence the answer is 2.

Possible solution:

Input:

49 7

```
C++
#include<bits/stdc++.h>
using namespace std;
bool isprime(int n)
{
        if(n==1)
                return false;
        for(int i=2;i<=(int)sqrt(n);i++)
        {
                if(n%i==0)
                        return false;
        }
        return true;
}
int main()
{
        int D,P,i,j,p,t=1;
        cin>>D>>P;
        p=D/P;
        int time[p][P];
        for(i=0;i<P;i++)
        {
                for(j=0;j<p;j++)
                {
                        time[j][i]=t++;
                }
        }
        t=0;
        for(i=0;i<p;i++)
        {
                bool flag=true;
                for(j=0;j<P;j++)
                {
                        if(!isprime(time[i][j]))
                        {
                                flag=false;
                                break;
                        }
                }
                if(flag)
                        t++;
        }
        cout<<t;
}
```

OUTPUT

```
0
```

Java 8

```
import java.util.*;
public class Main {
    public static boolean isprime(int n)
    {
        if(n==1) return false;
        for(int i=2;i<=(int) Math.sqrt(n) ; i++){
          if(n%i==0)
            return false;
        }
        return true;
    }
    public static void main(String[] args) throws Exception {
        // Your code here!
        Scanner sc= new Scanner(System.in);

        // System.out.println("XXXXXXXX");
        int i,j,D,P,p,t=1;
        D=sc.nextInt();
        P=sc.nextInt();
        p=D/P;
        int time[][] = new int [p][P];
        for(i=0;i<P;i++){
            for(j=0;j<p;j++){
                time[j][i]=t++;
            }
        }
        t=0;
        for(i=0;i<p;i++)
        {
            boolean flag=true;
            for(j=0;j<P;j++)
            {
                if(!isprime(time[i][j]))
                {
                    flag=false; break;
                }
            }
            if(flag) t++;
        }
        System.out.println(t);
    }
}
```

OUTPUT

```
0
```

Python

```
primes = set()
def generate(lim):
    for i in range(2, lim):
        x = 1
        for j in primes:
            if (i%j==0):
                x = 0
                break
                if x==1:
            primes.add(i)
d, p = map(int, input().split())
generate(d)
c = 0
inv = d//p
for i in range(inv):
    if i in primes:
        x = 1
        for j in range(1, p):
            if (j*inv+i) not in primes:
                x = 0
                break
        if x==1:
            c+=1
print(c)
```

```
OUTPUT
0
```

TCS CodeVita Questions #Q3

Minimum Gifts

A Company has decided to give some gifts to all of its employees. For that, the company has given some rank to each employee. Based on that rank, the company has made certain rules to distribute the gifts.

The rules for distributing the gifts are:

Each employee must receive at least one gift.

Employees having higher ranking get a greater number of gifts than their neighbours.

What is the minimum number of gifts required by the company?

Constraints

1 < T < 10

1 < N < 100000

1 < Rank < 10^9

Input

First line contains integer T, denoting the number of test cases.

For each test case:

First line contains integer N, denoting the number of employees.

Second line contains N space separated integers, denoting the rank of each employee.

Output

For each test case print the number of minimum gifts required on a new line.

<u>Example 1</u>

Input

2

5

1 2 1 5 2

2

1 2

Output

7

3

Explanation

For test case 1, adhering to the rules mentioned above,

Employee # 1 whose rank is 1 gets one gift

Employee # 2 whose rank is 2 gets two gifts

Employee # 3 whose rank is 1 gets one gift

Employee # 4 whose rank is 5 gets two gifts

Employee # 5 whose rank is 2 gets one gift

Therefore, total gifts required is 1 + 2 + 1 + 2 + 1 = 7

Similarly, for testcase 2, adhering to rules mentioned above,

Employee # 1 whose rank is 1 gets one gift

Employee # 2 whose rank is 2 gets two gifts

Therefore, total gifts required is 1 + 2 = 3

Possible solution:

Input:

```
2

5

1 2 1 5 2

2

1 2
```

C++

```
#include<bits/stdc++.h>
using namespace std;
long long arr[100010];
long long brr[100010];
int main()
{
  int test_case;
  cin >> test_case;
  for(int i = 1; i <= test_case; i++)
  {
    int n;
    long long gift = 0, temp = 0;
    cin >> n;
    for(int i = 0; i < n; i++)
    {
      cin >> arr[i];
    }
    brr[0] = 1;
    for(int i = 1; i < n; i++)
    {
      if(arr[i] > arr[i-1])
      {
        brr[i] = brr[i-1] + 1;
      }
      else
      {
        brr[i] = 1;
      }
    }
    gift = brr[n-1];
    for(int i = n-2; i >= 0; i--)
    {
      if(arr[i] > arr[i+1])
      {
        temp = brr[i+1] + 1;
      }
      else
        temp = 1;
      gift = gift + max(temp, brr[i]);
      brr[i] = temp;
    }
    cout << gift << endl;
  }
  return 0 ;
}
```

Output

```
7

3
```

Java

```
import java.util.Scanner;
public class Main {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int T = sc.nextInt();
        while (T-- > 0) {
            int n = sc.nextInt();
            int[] ar = new int[n];
            for (int i = 0; i < n; i++)
                ar[i] = sc.nextInt();
            int[] gifts = new int[n];
            gifts[0] = 1;
            // Left to Right Neighbors
            for (int i = 1; i < n; i++) {
                if (ar[i] > ar[i - 1])
                   gifts[i] = gifts[i - 1] + 1;
                else
                    gifts[i] = 1;
            }
            // Right to Left Neighbors
            for (int i = n - 2; i >= 0; i--) {
                if (ar[i] > ar[i + 1] && gifts[i] <= gifts[i + 1])
                    gifts[i] = gifts[i + 1] + 1;
            }
            long total = 0;
            for (int gift : gifts)
                total += gift;
            System.out.println(total);
        }
    }
}
```

Output

```
7

3
```

```
t = int(input())
while t>0:
    n = int(input())
    a = list(map(int, input().split()))
    gifts = [1]
    #gifts.append(1)
    for i in range(1, n):
      if a[i] > a[i-1]:
        gifts.append(gifts[i-1]+1)
      else:
        gifts.append(1)
    for i in range(n-2,-1,-1):
      if a[i]>a[i+1]:
        gifts[i] = max (1 + gifts[i+1], gifts[i])
    g = 0
    for i in range(n):
      g += gifts[i]
    print(g)
    t-=1
```

Output

```
7

3
```

TCS CodeVita Questions #Q4

Minimize the sum

Given an array of integers, perform atmost K operations so that the sum of elements of final array is minimum. An operation is defined as follows -

Consider any 1 element from the array, arr[i].

Replace arr[i] by floor(arr[i]/2).

Perform next operations on the updated array.

The task is to minimize the sum after utmost K operations.

Constraints

1 <= N, K <= 10^5.

Input

First line contains two integers N and K representing size of array and maximum numbers of operations that can be performed on the array respectively.

Second line contains N space separated integers denoting the elements of the array, arr.

Output

Print a single integer denoting the minimum sum of the final array.

Input

4 3

20 7 5 4

Output

17

Explanation

Operation 1 -> Select 20. Replace it by 10. New array = [10, 7, 5, 4]

Operation 2 -> Select 10. Replace it by 5. New array = [5, 7, 5, 4].

Operation 3 -> Select 7. Replace it by 3. New array = [5,3,5,4].

Sum = 17.

Possible Solution

Input:

4 3

20 7 5 4

Output

17

C++

```
#include<bits/stdc++.h>
using namespace std;
int main()
{
   long int n,k,temp,sum=0;
   cin>>n;
   cin>>k;
   vector<int> v;
   for(int i=0;i<n;i++)
   {
       cin>>temp;
       sum=sum + temp;
       v.push_back(temp);
   }
   make_heap(v.begin(),v.end());
   long int maxi = 0,res = 0;
   for(int i=0;i<k;i++)
   {
      maxi=v.front();
      sum-=maxi;
      pop_heap(v.begin(), v.end());
      v.pop_back();
      res = maxi / 2;
      sum+=res;
      v.push_back(res);
      push_heap(v.begin(),v.end());
   }
   cout<<sum;
}
```

Java 8

```
import java.util.*;
```

```
public class Main {
    public static void main(String[] args) throws Exception {
        // Your code  here!
        Scanner sc= new Scanner(System.in);
        // System.out.println("XXXXXXXX")
        int n,k,i,s=0;
        n=sc.nextInt();
        k=sc.nextInt();
        int a[]= new int [n];

        for(i=0;i<n;i++) a[i]=sc.nextInt();
        while(k-- > 0)
        {
            int mx=0,p=0;
            for(i=0;i<n;i++){
            if(a[i]>mx) {
                mx=a[i];
                p=i;
            }
            }
            a[p]=a[p]/2;
        }
        for(i=0;i<n;i++) s+=a[i];
        System.out.println(s);
    }
}
```

Python

```
n, k = map(int, input().split())
frequency = []
for i in range(100000):
    frequency.append(0)
sum = 0
a = list(map(int, input().split()))
for i in range(n):
    frequency[a[i]] += 1
j = 100000-1
while j>0 and k>0:
    while frequency[j]!=0 and k>0:
        k -= 1
        frequency[j] -=1
        frequency[j//2] += 1
          j-=1

for i in range(100000):
    sum += i*frequency[i]
print(sum)
```

TCS CodeVita Questions #Q5

Railway Station

Given schedule of trains and their stoppage time at a Railway Station, find minimum number of platforms needed.

Note -

If Train A's departure time is x and Train B's arrival time is x, then we can't accommodate Train B on the same platform as Train A.

Constraints

1 <= N <= 10^5

0 <= a <= 86400

0 < b <= 86400

Number of platforms > 0

Input

First line contains N denoting number of trains.

Next N line contain 2 integers, a and b, denoting the arrival time and stoppage time of train.

Output

Single integer denoting the minimum numbers of platforms needed to accommodate every train.

Example 1

Input

3

10 2

5 10

13 5

Output

2

Explanation

The earliest arriving train at time t = 5 will arrive at platform# 1. Since it will stay there till t = 15, train arriving at time t = 10 will arrive at platform# 2. Since it will depart at time t = 12, train arriving at time t = 13 will arrive at platform# 2.

Example 2

Input

2

2 4

6 2

Output

2

Explanation

Platform #1 can accommodate train 1.

Platform #2 can accommodate train 2.

Note that the departure of train 1 is same as arrival of train 2, i.e. 6, and thus we need a separate platform to accommodate train 2.

Possible Solution

C++

```
#include<bits/stdc++.h>
using namespace std;
int main()
{
	int n;
	cin>>n;
	int a[n],b[n];
	for(int i=0;i<n;i++)
	{
		cin>>a[i]>>b[i];
		b[i]=a[i]+b[i];
	}
	sort(a,a+n);
	sort(b,b+n);
	int p=1,r=1,i=1,j=0;
	while(i<n && j<n)
	{
		if(a[i]<=b[j])
```

```
                {
                        p++;
                        i++;
                }
                else if(a[i]>b[j])
                {
                        p--;
                        j++;
                }
                if(p>r)
                        r=p;
        }
        cout<<r;
}
```

Java 8

```
import java.util.Arrays;
import java.util.Scanner;
public class Main {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int n = sc.nextInt();
        int[] arr = new int[n];
        int[] dep = new int[n];
        for (int i = 0; i < n; i++) {
            arr[i] = sc.nextInt();
            int stoppage = sc.nextInt();
            dep[i] = arr[i] + stoppage;
        }
        Arrays.sort(arr);
        Arrays.sort(dep);
        int i = 1, j = 0, currPlatforms = 1, ans = 1;
        while (i < n && j < n) {
            if (arr[i] <= dep[j]) {
                i++;
                currPlatforms++;
            }
            else {
                currPlatforms--;
                j++;
            }
            ans = Math.max(ans, currPlatforms);
        }
        System.out.println(ans);
    }
}
```

Python 3

```
n = int(input())
arr = []
dep = []
for i in range(n):
  a, d = map(int, input().split())
  d += a
  arr.append(a)
  dep.append(d)
arr.sort()
dep.sort()
i = 1
j = 0
plf = 1
maxplf = 1
while i<n and j<n:
  if arr[i] <= dep[j]:
    i+=1
    plf+=1
    maxplf = max ( maxplf, plf )
    continue
  j+=1
  plf-=1
print(maxplf)
```

TCS CodeVita Questions #Q6

Count Pairs

Given an array of integers A, and an integer K find number of happy elements.

Element X is happy if there exists at least 1 element whose difference is less than K i.e. an element X is happy if there is another element in the range [X-K, X+K] other than X itself.

Constraints

1 <= N <= 10^5

0 <= K <= 10^5

0 <= A[i] <= 10^9

Input

First line contains two integers N and K where N is size of the array and K is a number as described above. Second line contains N integers separated by space.

Output

Print a single integer denoting the total number of happy elements.

Example 1

Input

6 3

5 5 7 9 15 2

Output

5

Explanation

Other than number 15, everyone has at least 1 element in the range [X-3, X+3]. Hence they are all happy elements. Since these five are in number, the output is 5.

<u>Example 2</u>

Input

3 2

1 3 5

Output

3

Explanation

All numbers have at least 1 element in the range [X-2, X+2]. Hence they are all happy elements. Since these three are in number, the output is 3.

Possible Solution

Input:

3 2

1 3 5

C++

```
#include <bits/stdc++.h>
using namespace std;
int pairs(int elementlst[],int n,int z){
 int count=0;
  for(int i=0;i<n;i++){
    int a=elementlst[i];
    int id1=i;
    int id2=i;
    if(i==0){
      while(elementlst[id2+1]==a)
         id2+=1;
      if(elementlst[id2+1]<=a+z && elementlst[id2+1]>=a-z)
        count+=1;
    }
    else if(i<n-1){
      while(elementlst[id2+1]==a)
        id2+=1;
      while(elementlst[id1-1]==a)
        id1-=1;
      if(((elementlst[id1-1]<=a+z) && (elementlst[id1-1]>=a-z)) || ((elementlst[id2+1]<=a+z)
&& (elementlst[id2+1]>=a-z)))
        count+=1;
    }
    else{
      while(elementlst[id1-1]==a)
        id1-=1;
      if(elementlst[id1-1]<=a+z && elementlst[id1-1]>=a-z)
        count+=1;
    }
  }
  return count;
}
int main() {
            int n,z;
            cin>>n>>z;
            int elementlst[n];
            for(int i=0;i<n;i++){
                cin>>elementlst[i];
            }
            sort(elementlst,elementlst+n);
            cout<<pairs(elementlst,n,z);
            return 0;
}
```

Java 8

```
import java.util.*;
```

```
public class Main {
    public static int pairs(int a[], int n , int z)
    {
        int c=0,i;
        for(i=0;i<n;i++)
        {
            int aa=a[i];
            int id1=i; int id2=i;
            if(i==0)
            {
                while(a[id2+1]==aa)
                id2++;
                if(a[id2+1]<=aa+z && a[id2+1]>=aa-z)
                c++;
            }
            else if(i<n-1)
            {
                while(a[id2+1]==aa)
                id2+=1;
                while(a[id1-1]==aa)
                id1-=1;
                if(((a[id1-1]<=aa+z) && (a[id1-1]>=aa-z)) || (
(a[id2+1]<=aa+z) && (a[id2+1]>=aa-z)))
                c+=1;
            }
            else
            {
                while(a[id1-1]==aa)
                id1-=1;
                if(a[id1-1]<=aa+z && a[id1-1]>=aa-z)
                c+=1;
            }
        }
        return c;
    }
    public static void main(String[] args) throws Exception {
        // Your code  here!
        Scanner sc= new Scanner(System.in);
        // System.out.println("XXXXXXXX")
        int n,k,i,s=0;
        n=sc.nextInt();
        k=sc.nextInt();
        int a[]= new int [n];

        for(i=0;i<n;i++) a[i]=sc.nextInt();
        Arrays.sort(a);
        System.out.print(pairs(a,n,k));
    }
}
```

Python 3

```
n, k = map(int, input().split())
a = set()
a = set(map(int, input().split()))
a = list(a)
if n==1:
    print("0")
else:
    a = sorted(a)
c = 0
for i in range(1, len(a)-1):
    if a[i]-a[i-1]>k and a[i+1]-a[i]>k :
        c += 1
if a[1]-a[0]>k:
    c+=1
if a[len(a)-1]-a[len(a)-2]>k:
    c +=1
print(n-c)
```

TCS CodeVita Questions #Q7

Critical Planets

The war between Republic and Separatists is escalating. The Separatists are on a new offensive. They have started blocking the path between the republic planets (represented by integers) so that these planets surrender due to the shortage of food and supplies. The Jedi council has taken note of the situation and they have assigned Jedi Knight Skywalker and his Padawan Ahsoka to save the critical planets from blockade (Those planets or system of planets which can be accessed by only one path and may be lost if that path is blocked by separatist).

Skywalker is preparing with the clone army to defend the critical paths. He has assigned Ahsoka to find the critical planets. Help Ahsoka to find the critical planets(C) in ascending order. You only need to specify those planets which have only one path between them and they cannot be accessed by any other alternative path if the only path is compromised.

Constraints

M <= 10000

N <= 7000

Input

First line contains two space separated integers M and N, where M denotes the number of paths between planets and N denotes the number of planets.

Next M lines, each contains two space separated integers, representing the planet numbers that have a path between them.

Output

C lines containing one integer representing the critical planet that they need to save in ascending order of the planet number if no planet is critical then print -1

Time Limit

1

Example 1

Input

3 4

0 1

1 2

2 3

Output

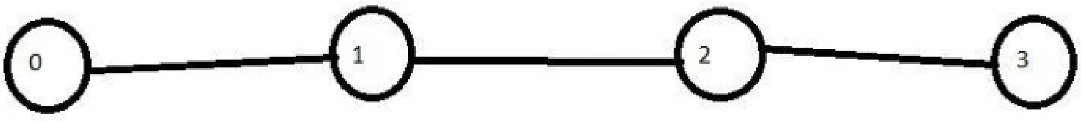
0

1

2

3

Explanation



Since all the planets are connected with one path and cannot be accessed by any alternative paths hence all the planets are critical.

<u>Example 2</u>

Input

7 6

0 2

0 1

1 2

2 3

4 5

3 4

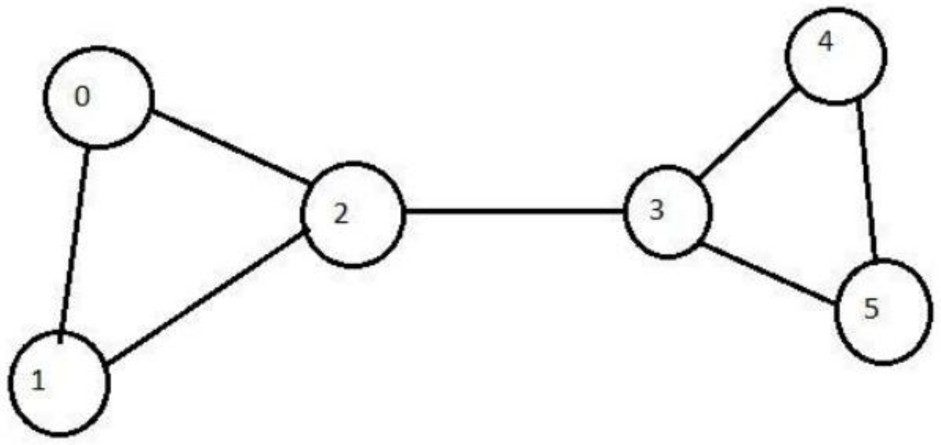
3 5

Output

2

3

Explanation



If the republic loose the path between 2 and 3 then the two system of planets will not be able to communicate with each other. Hence 2 and 3 are critical planets.

Possible Solution:

C++

```
#include <bits/stdc++.h>
typedef long long int lli;
#define pb push_back
using namespace std;
vector<int> adj[100001];
int visited[100001] , in[100001] ,low[100001];
int timer;
set<int> s;
void dfs(int node , int pre)
{
  visited[node] = 1;
  in[node] = low[node] = timer;
  timer++;
  for(int i : adj[node])
  {
    if(i == pre)
```

```
        continue;
      if(visited[i] == 1)
      {
        low[node] = min(low[node] , in[i]);
      }
      else
      {
        dfs(i , node);
        if(low[i] > in[node])
          s.insert(node) , s.insert(i);
        low[node] = min(low[node] , low[i]);
      }
    }
}
int main()
{
  int edge, vertex , a , b;
  cin >> edge >> vertex;
  for(int i = 0;i < edge;i++)
  {
    cin >> a >> b;
    adj[a].pb(b);
    adj[b].pb(a);
  }
  dfs(0 , -1);
  for(int i : s)
    cout << i << endl;
   return 0;
}
```

Java 8

```
import java.util.ArrayList;
import java.util.List;
import java.util.Scanner;
import java.util.TreeSet;
public class Main {
  static List<List<Integer>> graph;
  static TreeSet<Integer> criticalPlanets;
  static boolean[] visited;
  static int[] inTime;
  static int[] low;
  static int timer = 0;
  public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);
    int m = sc.nextInt();
    int n = sc.nextInt();
    graph = new ArrayList<>(n);
    for (int i = 0; i < n; i++)
      graph.add(new ArrayList<>());
    visited = new boolean[n];
    inTime = new int[n];
    low = new int[n];
    criticalPlanets = new TreeSet<>();
    for (int i = 0; i < m; i++) {
      int u = sc.nextInt();
      int v = sc.nextInt();
      graph.get(u).add(v);
      graph.get(v).add(u);
    }
    dfs(0, -1);
    for (int i : criticalPlanets)
      System.out.println(i);
  }
  public static void dfs(int node, int parent) {
    visited[node] = true;
    inTime[node] = low[node] = timer++;
    for (int neighbour : graph.get(node)) {
      if (neighbour == parent)
        continue;
      if (visited[neighbour])
        low[node] = Math.min(low[node], inTime[neighbour]);
      else {
        dfs(neighbour, node);
        if (low[neighbour] > inTime[node]) {
          criticalPlanets.add(neighbour);
          criticalPlanets.add(node);
        }
        low[node] = Math.min(low[node], low[neighbour]);
      }
    }
  }
}
```

Python 3

```
timer=0
def dfs (cur, par, timer):
    vis[cur]=1
    if cur!=0:
      low[cur] = trav[cur] = trav[par] + 1
    timer += 1
    for i in g[cur]:
        if i == par:
            continue
        if vis[i]==1:
            low[cur] = min ( low[cur], trav[i] )
        else:
            dfs(i, cur, timer)
            if low[i]>low[cur]:
                defend.add(i)
                defend.add(cur)
            low[cur] = min (low[cur], low[i])
e, n = map(int, input().split())
g = []
vis = []
low = []
trav = []
for i in range(n):
  l = []
  vis.append(0)
  low.append(0)
  trav.append(0)
  g.append(l)
for i in range(e):
  a, b = map(int, input().split())
  g[a].append(b)
  g[b].append(a)
defend = set()
dfs(0, -1, timer)
defend = list(defend)
defend.sort()
for i in defend:
  print(i)
```

TCS CodeVita Questions (Previous Years)

Practicing the previous year's TCS CodeVita questions will better understand the standard of questions asked.

Q1. **Consecutive Prime Sum**

Some prime numbers can be expressed as a sum of other consecutive prime numbers. For example 5 = 2 + 3, 17 = 2 + 3 + 5 + 7, 41 = 2 + 3 + 5 + 7 + 11 + 13. Your task is to find out how many prime numbers which satisfy this property are present in the range 3 to N subject to a constraint that summation should always start with number 2.

Write code to find out the number of prime numbers that satisfy the above-mentioned property in a given range.

S.no	Input	Output	Comment
1	20	2	(Below 20, there are 2 such members: 5 and 17) 5 = 2+3 17 = 2+3+5+7
2	15	1	

Input Format: First line contains a number N

Output Format: Print the total number of all such prime numbers which are less than or equal to N.

Constraints: 2<N<=12,000,000,000

Sample Possible solution:

```
#include <stdio.h>
int prime(int b)
{
   int j,cnt;
  cnt=1;
   for(j=2;j<=b/2;j++)
   {
      if(b%j==0)
      cnt=0;
```

```
    }
    if(cnt==0)
    return 1;
    elsereturn 0;
}
int main() {
 int i,j,n,cnt,a[25],c,sum=0,count=0,k=0;
 scanf("%d",&n);
 for(i=2;i<=n;i++)
 {
    cnt=1;
    for(j=2;j<=n/2;j++)
    {
        if(i%j==0)
        cnt=0;
    }
    if(cnt==1)
    {
       a[k]=i;
       k++;
       }
 }
 for(i=0;i<k;i++)
 {
    sum=sum+a[i];
   c= prime(sum);
   if(c==1)
   count++;
 }
 printf("%d",count);
 return 0;
}
```

Output:

```
20
2
```

Q2. **Bank Compare**

There are two banks – Bank A and Bank B. Their interest rates vary. You have received offers from both banks in terms of the annual rate of interest, tenure, and variations of the 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 the number of slabs of interest rates for a given period by Bank A. First slab starts from the first year and the second slab starts from the end of the 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 the second bank.
- Next N2 lines are the number of slabs of interest rates for a given period by Bank B. The first slab starts from the first year and the second slab starts from the end of the first slab and so on.
- The period and rate will be delimited by single white space.

Output Format: 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 A

Possible solution:

```
#include #includeint main() {
double p,s,mi,sum,emi,bank[5],sq;
int y,n,k,i,yrs,l=0;
  scanf("%lf",&p);
scanf("%d",&y);
for(k=0;k<2;k++)
{
scanf("%d",&n);
sum=0;
for(i=0;i<n;i++)
{
  scanf("%d",&yrs);
  scanf("%lf",&s);
  mi=0;
  sq=pow((1+s),yrs*12);
  emi= (p*(s))/(1-1/sq);
  sum= sum + emi;
}bank[l++]=sum;
}
if(bank[0]<bank[1])

printf("Bank A");

else

printf("Bank B");

return 0;

}
```

Q3. **Counting Rock Samples**

Juan Marquinho is a geologist and he needs to count rock samples in order to send it to a chemical laboratory. He has a problem: The laboratory only accepts rock samples by a range of its size in ppm (parts per million).

Juan Marquinho receives the rock samples one by one and he classifies the rock samples according to the range of the laboratory. This process is very hard because the number of rock samples may be in millions.

Juan Marquinho needs your help, your task is to develop a program to get the number of rocks in each of the ranges accepted by the laboratory.

Input Format:

An positive integer S (the number of rock samples) separated by a blank space, and a positive integer R (the number of ranges of the laboratory); A list of the sizes of S samples (in ppm), as positive integers separated by space R lines where the ith line containing two positive integers, space separated, indicating the minimum size and maximum size respectively of the ith range.

Output Format:

R lines where the ith line containing a single non-negative integer indicating the number of the samples which lie in the ith range.

Constraints: 10 ? S ? 10000 1 ? R ? 1000000 1?size of each sample (in ppm) ? 1000

Example 1

Input: 10 2

345 604 321 433 704 470 808 718 517 811

300 350

400 700

Output: 2 4

Explanation:

There are 10 samples (S) and 2 ranges (R). The samples are 345, 604,811. The ranges are 300-350 and 400-700. There are 2 samples in the first range (345 and 321) and 4 samples in the second range (604, 433, 470, 517). Hence the two lines of the output are 2 and 4

Example 2

Input: 20 3

921 107 270 631 926 543 589 520 595 93 873 424 759 537 458 614 725 842 575 195

1 100

50 600

1 1000

Output: 1 12 20

Explanation:

There are 20 samples and 3 ranges. The samples are 921, 107 195. The ranges are 1-100, 50-600 and 1-1000. Note that the ranges are overlapping. The number of samples in each of the three ranges are 1, 12 and 20 respectively. Hence the three lines of the output are 1, 12 and 20.

Possible Solution:

```
#include
int main() {
int a[1000],s,i,j,t,l1,l2,c=0;
scanf("%d",&s);
scanf("%d",&t);
for(i=0;i<s;i++)
scanf("%d",&a[i]);
for(i=0;i<t;i++)
{
```

```
scanf("%d %d",&l1,&l2);
for(j=0;j<s;j++)
{
 if((a[j]>=l1)&&(a[j]<=l2))
 c++;
}
printf("%dn ",c);
c=0;
}
return 0;
}
```

Q4. **kth largest factor of N**

A positive integer d is said to be a factor of another positive integer N if when N is divided by d, the remainder obtained is zero. For example, for number 12, there are 6 factors 1, 2, 3, 4, 6, 12. Every positive integer k has at least two factors, 1 and the number k itself.Given two positive integers N and k, write a program to print the kth largest factor of N.

Input Format: The input is a comma-separated list of positive integer pairs (N, k)

Output Format: The kth highest factor of N. If N does not have k factors, the output should be 1.

Constraints: 1<N<10000000000. 1<k<600. You can assume that N will have no prime factors which are larger than 13.

Example 1

- **Input**: 12,3
- **Output**: 4

Explanation: N is 12, k is 3. The factors of 12 are (1,2,3,4,6,12). The highest factor is 12 and the third-largest factor is 4. The output must be 4

Example 2

- **Input**: 30,9
- **Output**: 1

Explanation: N is 30, k is 9. The factors of 30 are (1,2,3,5,6,10,15,30). There are only 8 factors. As k is more than the number of factors, the output is 1.

Possible Solution:

```
#include <stdio.h>
int main() {
int n,k,i,c=0;
scanf("%d",&n);
scanf("%d",&k);
for(i=n;i>=1;i--)
{
 if((n%i)==0)
 c++;
 if(c==k)
 {
 printf("%d",i);
 break;
 }
}
if(c!=k)
printf("1");
return 0;
}
```

Q5. **Collecting Candies**

Krishna loves candies a lot, so whenever he gets them, he stores them so that he can eat them later whenever he wants to.

He has recently received N boxes of candies each containing Ci candies where Ci represents the total number of candies in the ith box. Krishna wants to store them in a single box. The only constraint is that he can choose any two boxes and store their joint contents in an empty box only. Assume that there are infinite number of empty boxes available.

At a time he can pick up any two boxes for transferring and if both the boxes say contain X and Y number of candies respectively, then it takes him exactly X+Y seconds of time. As he is too eager to collect all of them he has approached you to tell him the minimum time in which all the candies can be collected.

Input Format:

- The first line of input is the number of test case T
- Each test case is comprised of two inputs
- The first input of a test case is the number of boxes N
- The second input is N integers delimited by whitespace denoting the number of candies in each box

Output Format: Print minimum time required, in seconds, for each of the test cases. Print each output on a new line.

Constraints:

- 1 ?T?10
- 1 ?N? 10000
- 1 ? [Candies in each box] ? 100009

Sample Input and Output:

1	1
	4
	1 2 3 4
		19

2	1
	5
	1 2 3 4
		34

The explanation for sample input-output 1:

4 boxes, each containing 1, 2, 3, and 4 candies respectively.Adding 1 + 2 in a new box takes 3 seconds.Adding 3 + 3 in a new box takes 6 seconds.Adding 4 + 6 in a new box takes 10 seconds.Hence total time taken is 19 seconds. There could be other combinations also, but overall time does not go below 19 seconds.

The explanation for sample input-output 2:

5 boxes, each containing 1, 2, 3, 4, and 5 candies respectively.Adding 1 + 2 in a new box takes 3 seconds.Adding 3 + 3 in a new box takes 6 seconds.Adding 4 + 6 in a new box takes 10 seconds.Adding 5 + 10 in a new box takes 15 seconds.Hence total time taken is 34 seconds. There could be other combinations also, but overall time does not go below 33 seconds.

Possible Solution:

```
#include <stdio.h>
int main() {
int n,i,k=0,sum=0,s1=0,t,temp=0,j;
long c[100009],s[100009];
scanf("%d",&t);
for(int l=0;l<t;l++)
{
scanf("%d",&n);
for(i=0;i<n;i++)
scanf("%ld",&c[i]);
for(i=0;i<n;i++)
{
for(j=i+1;j<n;j++)
{
if(c[i]>c[j])
{
temp=c[i];
c[i]=c[j];
c[j]=temp;
}
}
}
sum=0;
k=0;
for(i=0;i<n;i++)
{
sum=sum+c[i];
s[k]=sum;
k++;
}
s1=0;
for(i=1;i<k;i++)
s1=s1+s[i];
printf("%dn",s1);
}
return 0;
}
```

Q6. **Football League**

Football League Table Statement : All major football leagues have big league tables. Whenever a new match is played, the league table is updated to show the current rankings (based on Scores, Goals For (GF), Goals Against (GA)). Given the results of a few matches among teams, write a program to print all the names of the teams in ascending order (Leader at the top and Laggard at the bottom) based on their rankings.

Rules: A win results in 2 points, a draw results in 1 point and a loss is worth 0 points. The team with the most goals in a match wins the match. Goal Difference (GD) is calculated as Goals For (GF) Goals Against (GA). Teams can play a maximum of two matches against each other Home and Away matches respectively.

The ranking is decided as follows: Team with maximum points is ranked 1 and minimum points is placed last Ties are broken as follows Teams with same points are ranked according to Goal Difference(GD).

If Goal Difference(GD) is the same, the team with higher Goals For is ranked ahead

If GF is same, the teams should be at the same rank but they should be printed in case-insensitive alphabetic according to the team names. More than 2 matches of same teams, should be considered as Invalid Input.

A team can't play matches against itself, hence if team names are same for a given match, it should be considered Invalid Input

Input Format: First line of input will contain number of teams (N) Second line contains names of the teams (Na) delimited by a whitespace character Third line contains number of matches (M) for which results are available Next M lines contain a match information tuple {T1 T2 S1 S2}, where tuple is comprised of the following information

- T1 Name of the first team
- T2 Name of the second team
- S1 Goals scored by the first team
- S2 Goals scored by the second team

Output Format: Team names in order of their rankings, one team per line OR Print "Invalid Input" where appropriate.

Constraints: 0< N <=10,000 0<=S1,S2

Example: Consider 5 teams Spain, England, France, Italy, and Germany with the following fixtures:

- Match 1: Spain vs. England (3-0) (Spain gets 2 points, England gets 0)
- Match 2: England vs. France (1-1) (England gets 1 point, France gets 1)
- Match 3: Spain vs. France (0-2) (Spain gets 0 points, France gets 2)

Table 1. Points Table after 3 matches

Spain	2	3	2	1
England	2	1	4	-3
France	2	3	1	2
Italy	0	0	0	0
Germany	0	0	0	0

Since Italy and Germany are tied for points, the goal difference is checked. Both have the same, so, Goals For is checked. Since both are the same. Germany and Italy share the 4th rank. Since Germany appears alphabetically before Italy, Germany should be printed before Italy. Then the final result is: France Spain England Germany Italy

Sample:

S.no	Input	Output
1	5	France
	Spain England France Italy Germany	Spain
	3	England
	Spain England 3 0	Germany
	England France 1 1	Italy
	Spain France 0 2	
2	5	Invalid input
	Spain England France Italy Germany	
	3	
	Spain England 3 0	
	England France 1 1	
	Spain Spain 0 2	

Q7. Sorting Boxes

The parcel section of the Head Post Office is in a mess. The parcels that need to be loaded to the vans have been lined up in a row in an arbitrary order of weights. The Head Post Master wants them to be sorted in the increasing order of the weights of the parcels, with one exception.He wants the heaviest (and presumably the most valuable) parcel kept nearest his office.

You and your friend try to sort these boxes and you decide to sort them by interchanging two boxes at a time. Such an interchange needs effort equal to the product of the weights of the two boxes.

The objective is to reposition the boxes as required with minimum effort.

Input Format: The first line consists of two space-separated positive integers giving the number of boxes (N) and the position of the Head Post Masters office (k) where the heaviest box must be.

The second line consists of N space separated positive integers giving the weights of the boxes. You may assume that no two weights are equal.

Output Format: The output is one line giving the total effort taken to get the boxes in sorted order, and the heaviest in position k.

Constraints: N<=50 and Weights <= 1000

Sample Input-output:

S.no	Input	Output
1	5 2 20 50 30 80 70	3600
2	6 3 30 20 40 80 70 60	Invalid input

Q8. **On A Cube**

A solid cube of 10 cm x 10cm x 10 cm rests on the ground. It has a beetle on it, and some sweet honey spots at various locations on the surface of the cube. The beetle starts at a point on the surface of the cube and goes to the honey spots in order along the surface of the cube.

- If it goes from a point to another point on the same face (say X to Y), it goes in an arc of a circle that subtends an angle of 60 degrees at the center of the circle

- If it goes from one point to another on a different face, it goes by the shortest path on the surface of the cube, except that it never travels along the bottom of the cube

The beetle is a student of cartesian geometry and knows the coordinates (x, y, z) of all the points it needs to go to. The origin of coordinates it uses is one corner of the cube on the ground, and the z-axis points up.Hence, the bottom surface (on which it does not crawl) is z=0, and the top surface is z=10.The beetle keeps track of all the distances traveled, and rounds the distance traveled to two decimal places once it reaches the next spot so that the final distance is a sum of the rounded distances from spot to spot.

Input Format: The first line gives an integer N, the total number of points (including the starting point) the beetle visits

The second line is a set of 3N comma separated non-negative numbers, with up to two decimal places each. These are to be interpreted in groups of three as the x, y, z coordinates of the points the beetle needs to visit in the given order.

Output Format: One line with a number giving the total distance traveled by the beetle accurate to two decimal places. Even if the distance traveled is an integer, the output should have two decimal places.

Constraints: None of the points the beetle visits is on the bottom face (z=0) or on any of the edges of the cube (the lines where two faces meet)

2<=N<=10

Sample Input-Output:

```
Input
3
1,1,10,2,1,10,0,5,9
Output
6.05
Input
3
1,1,10,2,1,10,0,1,9
Output
4.05
```

Q9. **Coins Distribution Question (or Coins Required Question)**

Problem Description

Find the minimum number of coins required to form any value between 1 to N, both inclusive. Cumulative value of coins should not exceed N. Coin denominations are 1 Rupee, 2 Rupee and 5 Rupee.

Let's understand the problem using the following example. Consider the value of N is 13, then the minimum number of coins required to formulate any value between 1 and 13, is 6. One 5 Rupee, three 2 Rupee and two 1 Rupee coins are required to realize any value between 1 and 13. Hence this is the answer.

However, if one takes two 5 Rupee coins, one 2 rupee coins and two 1 rupee coins, then to all values between 1 and 13 are achieved. But since the cumulative value of all coins equals 14, i.e., exceeds 13, this is not the answer.

Input Format

A single integer value

Output Format

Four Space separated Integer Values

1st – Total Number of coins

2nd – number of 5 Rupee coins.

3rd – number of 2 Rupee coins.

4th – number of 1 Rupee coins.

Constraints

0<n<1000

Sample Input:

13

Sample Output:

```
6 1 3 2
```

Explanation:

The minimum number of coins required is 6 with in it:

minimum number of 5 Rupee coins = 1

minimum number of 2 Rupee coins = 3

minimum number of 1 Rupee coins = 2

Using these coins, we can form any value with in the given value and itself, like below: Here the given value is 13

For 1 = one 1 Rupee coin

For 2 = one 2 Rupee coin

For 3 = one 1 Rupee coin and one 2 Rupee coins

For 4 = two 2 Rupee coins

For 5 = one 5 Rupee coin

For 6 = one 5 Rupee and one 1 Rupee coins

For 7 = one 5 Rupee and one 2 Rupee coins

For 8 = one 5 Rupee, one 2 Rupee and one 1 Rupee coins

For 9 = one 5 Rupee and two 2 Rupee coins

For 10 = one 5 Rupee, two 2 Rupee and one 1 Rupee coins

For 11 = one 5 Rupee, two 2 Rupee and two 1 Rupee coins

For 12 = one 5 Rupee, three 2 Rupee and one 1 Rupee coins

For 13 = one 5 Rupee, three 2 Rupee and two 1 Rupee coins

Solution in Python:

```
#get the input
number = int(input())



#find the number of five rupee coins#maximize possible number of coins, after leavinf out 4 rupees t
o make all possible values till 4
five = int((number-4)/5)



#find the number of one rupee coins#of the remaining value, number of one rupee coins is 1, if the v
alue is odd & it is 2 if the value is evenif((number-5*five) % 2) == 0:
   one=2else:
   one=1#find the number of two rupee coins#the rest of the amount will be from two rupee coins
two=(number-5*five-one)//2#print total coins, five ruppe coins, two rupee coins, one rupee coins
print(one+two+five,five,two,one)
```

Q10. Philaland Coins Question

Problem Description

The problem solvers have found a new Island for coding and named it as Philaland. These smart people were given a task to make the purchase of items at the Island easier by distributing various coins with different values.

Manish has come up with a solution that if we make coins category starting from $1 till the maximum price of the item present on Island, then we can purchase any item easily. He added following example to prove his point. Let's suppose the maximum price of an item is 5$ then we can make coins of {$1, $2, $3, $4, $5} to purchase any item ranging from $1 to $5. Now Manisha, being a keen observer suggested that we could actually minimize the number of coins required and gave following distribution {$1, $2, $3}. According to him, any item can be purchased one time ranging from $1 to $5. Everyone was impressed with both of them. Your task is to help Manisha come up with the minimum number of denominations for any arbitrary max price in Philaland.

Input Format

First line contains an integer T denoting the number of test cases. Next T lines contains an integer N denoting the maximum price of the item present on Philaland.

Output Format

For each test case print a single line denoting the minimum number of denominations of coins required.

Constraints

1<=T<=100

1<=N<=5000

Sample Input 1:

2

10

5

Sample Output 1:

4

3

Sample Input2:

3

1

5

7

Sample Output2:

1

3

3

Explanation:

For test case 1, N=10.

According to Manish {$1, $2, $3,… $10} must be distributed. But as per Manisha only {$1, $2, $3, $4} coins are enough to purchase any item ranging from $1 to $10. Hence minimum is 4. Likewise denominations could also be {$1, $2, $3, $5}. Hence answer is still 4.

For test case 2, N=5.

According to Manish {$1, $2, $3, $4, $5} must be distributed. But as per Manisha only {$1, $2, $3} coins are enough to purchase any item ranging from $1 to $5. Hence minimum is 3. Likewise denominations could also be {$1, $2, $4}. Hence answer is still 3.

Solution in Python:

```
#get input of number of cases

cases=int(input())



#for each case, find the coins requiredfor i in range(1,cases+1):

  #get input of value

  value=int(input())


  #set coin counter at 0

  coincount = 0#count the number of coins #logic number of coins required will be one more than th
e earlier rupee value that was a power of 2while value>=1:

    value=value//2

    coincount=coincount+1#print the answer    print (coincount)
```