Coding Questions

Question 1

In a Conference, attendees are invited for a dinner after the conference.The coordinator arranged around round tables for dinner and want to have an impactful seating experience for the attendees. Before finalizing the seating arrangement, he wants to analyze all the possible arrangements.These are R round tables and N attendees.

In case where N is an exact multiple of R, the number of attendees must be exactly N/R.

If N is not an exact multiple of R, then the distribution of attendees must be as equal as possible.

For example, R = 2 and N = 3
All possible seating arrangements are
(1,2) & (3)
(1,3) & (2)
(2,3) & (1)

Attendees are numbered from 1 to N.

Input Format
The first line contains T denoting the number of test cases.
Each test case contains two space separated integers R and N, Where R denotes the number of round tables and N denotes the number of attendees.

Output Format
Single Integer S denoting the number of possible unique arrangements.

Constraints
0<N<=20
0<=R<=10
Where N, R are integers

Sample IO
Input
1
2 5

Output
10

Explanation
The possible arrangements are as follows

(1,2,3) & (4,5)
(1,2,4) & (3,5)
(1,2,5) & (3,4)
(1,3,4) & (2,5)
(1,3,5) & (2,4)
(1,4,5) & (2,3)
(2,3,4) & (1,5)
(2,3,5) & (1,4)

(2,4,5) & (1,3)
(3,4,5) & (1,2)

Do note that (1,2,3) &(4,5) and (2,3,1)&(4,5) are the same i.e. the arrangement doesn't matter since it is a round table.

Question 2
You have 100 cards, numbered 1 to 100. You distribute them into k piles and collect back the piles in order. For example, if you distribute them into 4 piles, then the first pile will contain the cards numbered 1, 5, 9, … and the 4th pile will contain the cards numbered 4, 8, 12, …. While collecting back the cards you collect first the last pile, flip it bottom to top, then take the third pile, flip it bottom to top and put the cards on top of the 4th pile and so on. Next round, you distribute the cards into another set of piles and collect in the same manner (last pile first and first pile last).

If we have 10 cards, and put them into 2 piles, the order of the cards in the piles (top to bottom) would be 9, 7, 5, 3, 1 and 10, 8, 6, 4, 2.

We flip the piles to get the order 1, 3, 5, 7, 9 and 2, 4, 6, 8, 10
We put the second pile at the bottom and first on top of it to get the deck 1, 3, 5, 7, 9, 2, 4, 6, 8, 10

Given the number of rounds (m), the number of piles in each round (ki), you need to write a program to find the Nth card from the top at the end of the final round.

Input Format
The input consists of a single line of (m+2) comma-separated integers.
The first number is m, the number of rounds. The next m numbers are ki which represent the number of piles in each round.
The last number in the input is N, the position in the final pile whose value is to be determined.

Output Format
One integer representing the Nth card after all rounds have been played.

Constraints
Number of rounds <= 10, number of piles in each round <= 13.

Sample IO-1
Input
2 2 2 4

Output
13

Explanation
m = 2, k1 = 2, k2 = 2 and N = 4.
We have two rounds. The first round has two piles. At the end of the round, the deck is in the following order: 1, 3, 5, …, 99, 2, 4, 6, …, 100
The next round also has 2 piles and after the second round, the cards are in the order 1, 5, 9, 13, ….
The fourth card from the top has number 13.

Sample IO-2
Input
3 2 2 3 2

Output
13

Explanation
m = 3, k1 = 2, k2 = 2, k3 = 3 and N = 2.
After the second round, the cards are in the order 1, 5, 9, 13, …
The third round has 3 piles. Thus after this round the cards will be in the order 1, 13, …. the Second card is 13

Question 3
Abebe is an island near Africa which is very prone to forest fire which causes total destruction. In this island, the wind pattern is very random. On any given whenever a tree catches fire, it passes the fire to all its adjacent tree in all 8 directions:

North, South, East, West, North-East, North-West, South-East, and South-West.

It is given that the fire is spreading every minute in the given directions of the wind, i.e every tree spreads fire to the adjacent tree. The spread happens every minute. The forest layout is represented as a M X N matrix, where where T denotes tree and W denotes water.

Your task is that given the location of the first tree that catches fire, determine how long would it take for the entire forest to be on fire. You may assume that the lay out of the forest is such that the whole forest will catch fire for sure and that there will be at least one tree in the forest.

Input Format
First line contains two space separated integers M and N, giving the size of the forest in terms of the number of rows and columns respectively.
The next line contains two space separated integers X and Y, giving the coordinates of the first tree that catches the fire.
The next M lines consist of the M X N matrix, where ith line containing N characters each of which is either T or W, giving the position of the Tree and Water.

Output Format
Single integer indicating the number of minutes taken for the entire forest to catch fire

Sample IO-1
Input
3 3
W T T
T W W
W T T

Output
5

Explanation
In the second minute, tree at (1,2) catches fire, in the third minute, the tree at (2,1) catches fire, in the fourth minute tree at (3,2) catches fire and finally, in the fifth minute the last tree at (3,3) catches fire.

Sample IO-2
Input

6 6
1 6
W T T T T T
T W W W W W
W T T T T T
W W W W W T
T T T T T T
T W W W W W

Output
16

Constraints
3 ≤ M ≤ 20
3 ≤ N ≤ 20

Question 4
Given two non-negative integers n1 and n2, where n1<n2. You have to find the total number of integers within n1 and n2 i.e [n1, n2].

Note:
[n1, n2] means a range with both n1 and n2 included
(n1, n2) means a range with both n1 and n2 excluded (all numbers between n1 and n2 can be choosen
[n1, n2) means a range between n1 and n2, where only n1 is included and n2 is excluded
(n1, n2] means a range between n1 and n2, where only n2 is included and n1 is excluded

Input Format
Two space separated integers n1 and n2 in the first line

Output Format
The output integer specified in the problem statement

Sample IO-1
Input
11 15

Output
4

Sample IO-2
Input
101 200

Output
72

Question 5
Given a range [low, high], select K numbers from the range such that sum of those K numbers is even. Note that the numbers can be choosen multiple times and that the range of [low, high] is inclusive i.e. both 'low' and 'high' numbers can be selected.

Calculate the number of all such permutations. The number must be printed with modulo (1e9 +7).

Note
In competitive programming problems, we are required to answer the result in 10^9+7 modulo. The reason behind this is, if problem constraints are large integers, only efficient algorithms can solve them in an allowed limited time.

Constraints
0 <= low <= high <= 10^9
K <= 10^6

Input Format
First line contains two space separated integers denoting low and high respectively
Second line contains a single integer K

Output Format
Print a single integer denoting the number of all such permutations

Sample IO-1
Input
4 5
3

Output
4

Explanation
There are 4 valid permutations viz. {4, 4, 4}, {4, 5, 5}, {5, 4, 5} and {5, 5, 4} which sum up to an even number.

Sample IO-2
Input
1 10
2

Output
50

Explanation
There are 50 valid permutations viz. {1,1}, {1, 3},.. {1, 9} {2,2}, {2, 4},… {2, 10} . . . {10, 2}, {10, 4},… {10, 10}. These 50 permutations, each sum up to an even number.

Question 6
Ravi invented a Time Machine and wants to test it by time-traveling to visit Russia on the Day of Programmer (the 256thday of the year) during a year in the inclusive range from 1700 to 2700. From 1700 to 1917, Russia's official calendar was the Julian Calendar; since 1919 they used the Gregorian

calendar system. The transition from the Julian to Gregorian calendar system occurred in 1918, when the next day after 31 January was February 14 . This means that in 1918, February 14 was the 32nd day of the year in Russia. In both calendar systems, February is the only month with a variable amount of days; it has 29 days during a leap year, and 28 days during all other years. In the Julian calendar, leap years are divisible by 4 ; in the Gregorian calendar, leap years are either of the following

- Divisible by 400
- Divisible by 4 and not divisible by 100

Given a year, y, find the date of the 256th day of that year according to the official Russian calendar during that year. Then print it in the format dd.mm.yyyy, where dd is the two-digit day, mm is the two-digit month, and yyyy is y.

For example, the given year is 1984.1984 is divisible by 4, so it is a leap year. The 256 day of a leap year after 1918 is September 12, so the answer is 12.9.1984.

Input Format
A single integer denoting year y

Output Format
Print the full date of programmer's day during year y in the format dd.mm.yyyy, where dd is the two-digit day, mm is the two-digit month, and yyyy is y

Sample IO
Input
2017

Output
13.09.2017

Question 7
One person hands over the list of digits to Mr. String, But Mr. String understands only strings. Within strings also he understands only vowels. Mr. String needs your help to find the total number of pairs which add up to a certain digit D.

The rules to calculate digit D are as follows:

- Take all digits and convert them into their textual representation.
- Next, sum up the number of vowels i.e. {a, e, i, o, u} from all textual representation. This sum is digit D.
- Now, once digit D is known find out all unordered pairs of numbers in input whose sum is equal to D.

Given an array arr[] consisting of N ($1 \le N \le 100$) integers, the task is to convert each array element ($1 \le arr[i] \le 100$) into their respective textual representations and print the lowercase representation of the count of all possible pairs from the array whose sum is equal to the total count of vowels present in their textual representation. If the count exceeds 100 print "greater 100".

Note
For the number 100, convert it to textual representation as hundred and not as one hundred.

Output Constraints

The output can be any one of zero, one, two, three, four, five, six, seven, eight, nine, ten

Test Case #1
Sample Input
5
1 2 3 4 5

Sample Output:
one

Test Case #2
Sample Input
3
7 4 2

Sample Output:
Zero

Question 8
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 period and their interest rate respectively.
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

Sample IO
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

Sample IO-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

Question 9
Compute the nearest larger number by interchanging its digits updated.Given 2 numbers a and b find the smallest number greater than b by interchanging the digits of a and if not possible print -1.

Input Format
2 numbers a and b, separated by space.

Output Format
A single number greater than b.
If not possible, print -1

Constraints
1 <= a,b <= 10000000

Sample IO-1
Input
459 500

Output
549

Sample IO-2

Input
645757 457765

Output
465577

Question 10
You will be given an array of integers and a target value. Determine the number of pairs of array elements that have a difference equal to a target value.

For example, given an array of [1, 2, 3, 4] and a target value of 1, we have three values meeting the condition: 2-1 = 1, 3-2 = 1, and 4-3 = 1.

Write a function pairs(k, arr) where It must return an integer representing the number of element pairs having the required difference.

pairs(k, arr) has the following parameter(s):
k: an integer, the target difference
arr: an array of integers

Input Format
The first line contains two space-separated integers n and k, the size of arr and the target value.
The second line contains n space-separated integers of the array arr.

Sample Input
5 2
1 5 3 4 2

Sample Output
2

Question 11
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 3×3 block. Stars cannot be overlapping. The dot (.) character denotes empty space.

Given a matrix mat[][] of dimensions 3×N consisting of {#, *, .} character, the task is to find the galaxy and stars within them.

Input Format
The First line contains the integer N
Subsequent lines contain the matrix elements

Note
You can assume that there is a method printGalaxy already present which takes in the input as parameters

Sample IO-1

Input
18
* . * # * * * # * * * # * * * . * .
* . * # * . * # . * . # * * * * * *
* * * # * * * # * * * # * * * * . *

Output
U#O#I#EA

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

Sample IO-2
Input
12
* . * # . * * * # . * .
* . * # . . * . # * * *
* * * # . * * * # * . *

Output
U#I#A

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

Solution
The idea is to traverse the matrix column-wise using the variable i from the range [0, N – 1] and check if the given arrangement of {#, *, . } forms a galaxy, an empty space, or a vowel. There arise the following cases:

- When all '#' is encountered in the given column: In this case, print '#' and continue traversing the matrix.
- When all '.' is encountered in the given column: In this case, skip the current column and continue traversing the matrix.
- For all other cases check if the given arrangement of {#, *, .} forms a vowel, then print the vowel and update the column index i to (i + 3).

Question 12
Given an array of equal-length strings arr[] of length N, the task is to make all the strings of the array equal by replacing any character of a string with any other character, minimum number of times.

You can assume that there is a method minOperation(arr, N) which takes in an array and an integer. You can just fill in this metho.d

Sample IO-1
Input
arr[] = {west", "east", "wait"}

Output
3

Explanation
Replacing arr[0][1] with ‘a’ modifies arr[] to { “west”, “east”, “wait” }.
Replacing arr[1][0] with ‘w’ modifies arr[] to { “wast”, “wast”, “wait” }.
Replacing arr[2][2] with ‘s’ modifies arr[] to { “wast”, “wast”, “wast” }.
Therefore, the required output is 3.

Sample IO-2
Input
arr[] = { “abcd”, “bcde”, “cdef” }

Output
8

Solution

The problem can be solved using Hashing. Follow the steps below to solve the problem:

- Initialize a 2D array, say hash[][], where hash[i][j] stores the frequency of the character i present at the jth index of all the strings.
- Traverse the array arr[] using variable i. For every ith string encountered, count the frequency of each distinct character of the string and store it into the hash[][] array.
- Initialize a variable, say cntMinOp, to store the minimum count of operations required to make all the strings of the array equal.
- Traverse the array hash[][] using variable i. For every ith column encountered, calculate the sum of the column, say Sum, the maximum element in the column, say Max, and update cntMinOp += (Sum – Max).
- Finally, print the value of cntMinOp.

Question 13

Given a non-negative integer n. The problem is to reverse the bits of n and print the number obtained after reversing the bits. Note that the actual binary representation of the number is being considered for reversing the bits, no leading 0’s are being considered.

Sample IO
Input : 11
Output : 13
(11)10 = (1011)2.
After reversing the bits we get:
(1101)2 = (13)10.

Input : 10
Output : 5
(10)10 = (1010)2.
After reversing the bits we get:
(0101)2 = (101)2
= (5)10.