International Islamic University Chittagong
Department of Computer Science and Engineering

Course Title: Competitive Programming II
Course Code: CSE-2430

Final Term Exam
SET A

1. Given a number N, write its prime factorization.

Input:

First line contains the integer T, number of test cases. Next T line contains a single integer N, denoting the number whose prime factorization is to be written.

T <= 100000
N <= 1000000

Output:

Prime factorisation of the number. Each number should be separated by '*' and we will not print any '*' at the beginning or at the end.

Sample Input Sample Output
2

18

2 | 2 * 3 * 3

2 |

2. Farmer John has built a new long barn, with N (2 <= N <= 100,000) stalls. The stalls are located along a straight line at positions x1 ... xN (0 <= xi <= 1,000,000,000).

His C (2 <= C <= N) cows don't like this barn layout and become aggressive towards each other once put into a stall. To prevent the cows from hurting each other, FJ wants to assign the cows to the stalls, such that the minimum distance between any two of them is as large as possible. What is the largest minimum distance?

Input:

> t – the number of test cases, then t test cases follows.
> * Line 1: Two space-separated integers: N and C
>
> * Lines (2 to N+1): Line i+1 contains an integer stall location, x[i]

Output:

For each test case output one integer: the largest minimum distance.

Sample Input	Sample Output
1 5 3 1 2 8 4 9	3

3. Given a number T.

   Also, an integer array *arr* of size N is given.

   Your task is to construct a number X that is:

   1. Strictly less than or equal to T.
   2. And, we should construct the X in such a way that the usage of the elements of the array *arr* is maximized i.e. We need to use maximum possible elements from the array that adds up to no more than T.

   For example, if T is 10 and our array is [2, 4, 6, 1, 3, 5] then we can pick 2, 4, 1 and 3 which results in 10. And, we've picked 4 elements from the array. It can be shown that we cannot pick more than 4 elements here to make the result X less or equal to 10.

   In this task, we need to print two integers X and Y.

   X is the number that we've constructed and Y is the count of elements that we've used to construct the X.

   Input:

   First line contains an integer T ($1 \leq T \leq 10^5$)

   Second line contains an integer N ($1 \leq N$ v$\leq 10^5$)

   Next line contains an array, *arr* of length N ($0 \leq arr[i] \leq T$).

   Output:

   Output X and Y separated by a space.

Sample Input	Sample Output
10 6 2 4 6 1 3 5	10 4

4. Given n, i.e. total number of nodes in an undirected graph numbered from 1 to n and an integer e, i.e. total number of edges in the graph. Calculate the total number of connected components in the graph. A connected component is a set of vertices in a graph that are linked to each other by paths.

Input:

First line of the input lines contains two integers n and e. Next e line will contain two integers u and v meaning that node u and node v are connected to each other in undirected fashion.

All the input values are well within the integer range.

Output:

For each input graph print an integer x denoting the total number of connected components.

Sample Input	Sample Output
8 5 1 2 2 3 2 4 3 5 6 7	3