

Kick Start 2020 - Round A

Workout

Problem

Tambourine has prepared a fitness program so that she can become more fit! The program is made of N sessions. During the i -th session, Tambourine will exercise for M_i minutes. The number of minutes she exercises in each session are *strictly increasing*.

The *difficulty* of her fitness program is equal to the maximum difference in the number of minutes between any two consecutive training sessions.

To make her program less difficult, Tambourine has decided to add up to K additional training sessions to her fitness program. She can add these sessions anywhere in her fitness program, and exercise any positive integer number of minutes in each of them. After the additional training session are added, the number of minutes she exercises in each session must still be strictly increasing. What is the minimum difficulty possible?

Input

The first line of the input gives the number of test cases, T . T test cases follow. Each test case begins with a line containing the two integers N and K . The second line contains N integers, the i -th of these is M_i , the number of minutes she will exercise in the i -th session.

Output

For each test case, output one line containing `Case #x: y`, where x is the test case number (starting from 1) and y is the minimum difficulty possible after up to K additional training sessions are added.

Limits

Time limit: 20 seconds.

Memory limit: 1 GB.

$1 \leq T \leq 100$.

For at most 10 test cases, $2 \leq N \leq 10^5$.

For all other test cases, $2 \leq N \leq 300$.

$1 \leq M_i \leq 10^9$.

$M_i < M_{i+1}$ for all i .

Test Set 1

$K = 1$.

Test Set 2

$1 \leq K \leq 10^5$.

Sample

Note: there are additional samples that are not run on submissions down below.

Sample Input	Sample Output
1 3 1 100 200 230	Case #1: 50

In Sample Case #1: Tambourine can add up to one session. The added sessions are marked in bold: 100 **150** 200 230. The difficulty is now 50.

Additional Sample - Test Set 2

The following additional sample fits the limits of Test Set 2. It will not be run against your submitted solutions.

Sample Input	Sample Output
3 5 2 10 13 15 16 17 5 6 9 10 20 26 30 8 3 1 2 3 4 5 6 7 10	Case #1: 2 Case #2: 3 Case #3: 1

In Sample Case #1: Tambourine can add up to two sessions. The added sessions are marked in bold: 10 **12** 13 **14** 15 16 17. The difficult is now 2.

In Sample Case #2: Tambourine can add up to six sessions. The added sessions are marked in bold: 9 10 **12 14 16 18** 20 **23** 26 **29** 30. The difficulty is now 3.

In Sample Case #3: Tambourine can add up to three sessions. The added sessions are marked in bold: 1 2 3 4 5 6 7 **8 9** 10. The difficulty is now 1. Note that Tambourine only added two sessions.

Note: Unlike previous editions, in Kick Start 2020, all test sets are visible verdict test sets, meaning you receive instant feedback upon submission.