Problem

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

The difficulty of her fitness program is equal to the maximum difference in the number of minutes between any two onsecutive 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 m nutes in each of them. After the additional training session are added, the number of minutes she exercises in each se sion 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 cont ining the two integers N and K. The second line contains N integers, the i-th of these is Mi, the number of minutes s e 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 th minimum difficulty possible after up to K additional training sessions are added.

Limits

Time limit: 20 seconds per test set.
Memory limit: 1GB.
$1 \leq T \leq 100$.
For at most 10 test cases, $2 \leq N \leq 105$.
For all other test cases, $2 \leq N \leq 300$.
$1 \leq Mi \leq 109$.
$Mi < Mi+1$ for all i.

Test set 1

$K = 1$.

Test set 2

$1 \leq K \leq 105$.

Samples

Input 1

Output 1

```
1
3 1
100 200 230
```

Case #1: 50

Input 2

Output 2

```
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
```

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

Sample #2
In Case #1: Tambourine can add up to six sessions. The added sessions are marked in bold: 9 10 12 14 16 18 20 23 2 29 30. The difficulty is now 3.

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

Note #1: Only Sample #1 is a valid input for Test set 1. Consequently, Sample #1 will be used as a sample test set fo your submissions.
Note #2: Unlike previous editions, in Kick Start 2020, all test sets are visible verdict test sets, meaning you receive i stant feedback upon submission.

```
#include <bits/stdc++.h>
using namespace std;

#define ll long long
#define ar array

int n, k, a[100000];

void solve() {
 cin >> n >> k;
 for(int i=0; i<n; ++i)
  cin >> a[i];

 int lb=1, rb=a[n-1]-a[0];
 while(lb<rb) {
  int mb=(lb+rb)/2;
  int k2=0;
  for(int i=1; i<n; ++i) {
   int d=a[i]-a[i-1];
   //ceil(d/(n+1))<=mb
   //d<=mb*(n+1)
```

```
   //d/mb-1<=n
   k2+=(d+mb-1)/mb-1;
  }
  if(k2<=k)
   rb=mb;
  else
   lb=mb+1;
 }
 cout << lb << "\n";
}

int main() {
 ios::sync_with_stdio(0);
 cin.tie(0);

 int t, i=1;
 cin >> t;
 while(t--) {
  cout << "Case #" << i << ": ";
  solve();
  ++i;
 }
}
```