Kick Start 2020 - Round G

Combination Lock

Problem

A combination lock has **W** wheels, each of which has the integer values 1 through **N** on it, in ascending order.

At any moment, each wheel shows a specific value on it. $\mathbf{X_i}$ is the initial value shown on the i-th wheel.

You can use a single move to change a wheel from showing the value X to showing either X+1 or X-1, wrapping around between 1 and **N**. For example, if a wheel currently shows the value 1, in one move you can change its value to 2 or **N**.

Given all wheels' initial values, what is the minimum number of moves to get all wheels to show the same value?

Input

The first line of the input gives the number of test cases, **T**. **T** test cases follow.

The first line of each test case contains the two integers **W** and **N**.

The second line contains **W** integers. The i-th integer is $\mathbf{X_i}$.

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 number of moves to get all wheels to show the same value.

Limits

Time limit: 40 seconds.
Memory limit: 1 GB.
$1 \leq \mathbf{T} \leq 100$.
$1 \leq \mathbf{X_i} \leq \mathbf{N}$.

Test Set 1

$1 \leq \mathbf{W} \leq 1000$.
$2 \leq \mathbf{N} \leq 1000$.

Test Set 2

$1 \leq \mathbf{W} \leq 1000$.
$2 \leq \mathbf{N} \leq 10^9$.

Test Set 3

$1 \le \mathbf{W} \le 10^5$.
$2 \le \mathbf{N} \le 10^9$.

Sample

Sample Input	Sample Output
2 3 5 2 3 4 4 10 2 9 3 8	Case #1: 2 Case #2: 8

In Sample Case #1, the best solution is to get all wheels to show value 3, which would take a total of 2 moves: the first wheel would move once (from value 2 to value 3), the second wheel would not move (it already shows value 3), and the third wheel would move once (from value 4 to value 3).

For reference, it would take 5 moves to get all wheels to show value 1, 3 moves to get all wheels to show value 2, 3 moves to get all wheels to show value 4, and 5 moves to get all wheels to show value 5.

In Sample Case #2, the best solutions are to get all wheels to show either value 1, 2, 9 or 10, which would take a total of 8 moves.