6442 Coins on a Ring

In this problem, you're going to work with a ring which has N equidistant slots numbered from 0 to $N-1$ (refer to Figure 1.a). There are M coins which are located at some of those N slots on the ring (one slot may contain more than one coin). Your task is to move some of the coins if needed such that the distances between all adjacent coins are equal and the cost to achieve such configuration is as low as possible. The cost to achieve a configuration is equal to the maximum distance of any coin moved from its original position. Note that there must be no two or more coins which are located at a same slot in the final configuration.

For example, let there be a ring with 12 slots ($0 \ldots 11$) and 4 coins at slot position 11, 1, 2 and 5 as shown in Figure 1(a).

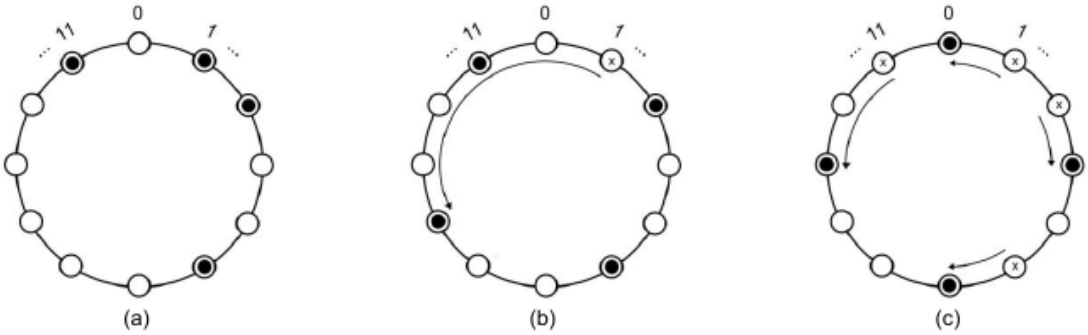

Figure 1

One way to achieve a configuration where all adjacent coins are equidistant is shown in Figure 1(b):

- Move coin from slot 1 to slot 8 counter clockwise, cost = 5.

The cost to achieve this configuration is 5.

Another configuration is shown in Figure 1(c):

- Move coin from slot 1 to slot 0 counter clockwise, cost = 1.
- Move coin from slot 2 to slot 3 clockwise, cost = 1.
- Move coin from slot 5 to slot 6 clockwise, cost = 1.
- Move coin from slot 11 to slot 9 counter clockwise, cost = 2.

The cost to achieve this configuration is 2, which is better than the previous one. Actually, the minimum cost needed for this case is 2 and Figure1(c) shows one such example configuration.

Given a ring with N slots and M coins as described above, determine the minimum cost to move the coins (if needed) such that all adjacent coins are equidistant. You may assume M always divides N.

Input

The first line of input contains an integer T ($T \leq 100$) denoting the number of cases. Each case begins with two integers N ($2 \leq N \leq 1,000,000$) and M ($2 \leq M \leq 20,000$; M divides N) in a line which represent the number of slots and the number of coins on the ring respectively. The next line contains M integers C_i ($0 \leq C_i < N$) which represent the position of each coin on the ring.

Output

For each case, output '`Case #`X`:  `Y', where X is the case number starts from 1 and Y is the minimum cost needed to move all coins such that all adjacent coins are equidistant.

Notes:

- Explanation for 1st sample case

  This sample corresponds to example in the problem statement.

- Explanation for 2nd sample case One configuration with the minimum cost:

  – Move 1st coin (from slot 1) counter clockwise to slot 12, cost = 4.

  – Move 3rd coin (from slot 1) counter clockwise to slot 0, cost = 1.

  – Move 4th coin (from slot 1) clockwise to slot 3, cost = 2.

  – Move 5th coin (from slot 2) clockwise to slot 6, cost = 4.

  After these movements, the coins are located in slot 0, 3, 6, 9 and 12 which are equidistant to each other. The cost to achieve this configuration is 4.

Sample Input

```
3
12 4
11 1 2 5
15 5
1 9 1 1 2
10 2
3 4
```

Sample Output

```
Case #1: 2
Case #2: 4
Case #3: 2
```