A Man, A Plan, A Canal, Panama

Filename: `canalanac`

As you probably know, a palindrome is a string whose alphanumeric characters are the same both forwards and backwards. Perhaps the most famous palindrome of all time is: "A man, a plan, a canal, Panama" that describes Teddy Roosevelt and the building of the Panama Canal. Like every canal designer and palindrome connoisseur, you want to one-up Teddy by building a canal that connects the two halves of Ekalaka Lake (located in Ekalaka, Montana)!

Your canal will consist of at most k level sections of water that span n meters of land. The water level of a section must be an integer strictly greater than the land height anywhere within that section. A section of the canal is a continuous region of water that is entirely the same height. To make building the canal easier, you need to minimize the total height of the water levels across all x coordinates (not necessarily across all sections). Formally, you need to minimize $\Sigma\, w(i)$ where $1 \leq i \leq n$, and $w(i)$ is the water height at x-coordinate i.

Now, since you really want a spot in the Palindromic Hall of Fame (nevermind Mt. Rushmore), you also want the heights of the water in your canal to form a palindrome. That is, $w(i)$ should equal $w(n\text{-}i\text{+}1)$ for all $1 \leq i \leq n$.

Oh, and one last thing: The sum of all water heights across all x values without leading zeros needs to be a palindrome too. Good luck!

The Problem:

Find the minimum sum of the water heights such that your canal has no more than k sections, a side-view of the canal would be palindromic, and the sum of water heights is a palindrome.

The Input:

The first line of input contains a single, positive integer, c, representing the number of canals you want to build. The descriptions of each canal follow. The first line of each description contains two integers n and k ($1 \leq k \leq n \leq 50$), representing the length of land your canal must cross, and the maximum number of sections you are allowed to have, respectively. The next line contains n integers: the heights of the land that boats must be able to go over. All heights are between 1 and 350, inclusive.

The Output:

For each canal, output a single line containing "`Canal #`*`i`*`: `*`t`*" where *`i`* is the canal number in the input (starting with 1) and *`t`* is minimum sum of the water heights required in that canal, such that the water level is strictly higher than the land at every x-coordinate, the canal contains no more than k sections, the canal is palindromic when viewed from the side, and *`t`* is a palindromic integer. If it is impossible to create any palindromic canal that meets the desired conditions, output "`Canal #`*`i`*`: Impossible`" instead.

Sample Input:

```
3
5 3
4 4 1 1 2
5 1
4 4 1 1 2
10 1
2 2 2 1 1 1 2 1 2 1
```

Sample Output:

```
Canal #1: 22
Canal #2: 55
Canal #3: Impossible
```