Problem 4 - Mizuki Kingdom

Mizuki Kingdom is a neighborhood country next to Skyland. Different from Skyland, Mizuki Kingdom uses a highway to connect the cities. In particular, there is a straight highway with cities alongside the highway. For convenience, the highway is represented as an integer axis, and the position of each city is denoted by a single integer coordinate. The distance between two cities is defined as the absolute value of the difference of their integer coordinates.

In addition to the highway, which is affordable for the local traffic, the government now wants to build a few international airports. There are n cities in Mizuki Kingdom and the government wants to build k international airports. To allow easier planning, we can assume that the government only builds airports in existing cities. However, whether the new airports could serve the majority of the population of the kingdom depends on their locations. Therefore, given the coordinates of the cities, please design an algorithm to determine an optimal set of locations for these new airports, such that the **maximum** distance between the cities and their nearest international airports is minimized.

Input Format

The first line contains an integer T indicating the number of test cases. Each test case starts with a line containing two integers n, k, specifying the number of cities and airports. The next line contains n integers $x_1, x_2, \ldots, x_n$, specifying the positions of each city.

- $1 \leq T \leq 10$
- $1 \leq k \leq n \leq 100000$
- $1 \leq x_i \leq 10^9$

Output Format

For each test case, please output the **maximum** distance between the cities and their nearest international airports in the optimal solution.

Sample Input

```
3
3 1
1 3 7
4 2
1 2 3 4
8 3
2000 2012 2014 1 3 5 7 314159
```

Sample Output

```
4
1
12
```