Problem C: Cantaloupe

Filename: *cantaloupe*
Time limit: *3 seconds*

Cara loves cantaloupe! In fact, she loves all fruit and is very particular about the ripeness of her fruit. Because of this she keeps track of the day that each of her fruits peaks in ripeness. Cara wants to eat at least ***m*** of her fruits, but she also wants to spread out her enjoyment of the fruit as long as possible. For example, if she eats fruits on days 4, 9, 13 and 20, each gap between eating fruit is at least 4 days long. A preferable schedule would be to eat fruits on days 10, 15, 20 and 25, where each gap is at least 5 days long. Thus, notice that the number of days between the first and last fruit eaten doesn't matter, but rather the guaranteed gap between each pair of days eating fruit. Cara needs your help to determine her fruit eating schedule and of course she will only eat a piece of fruit at its peak ripeness.

The Problem

Given the minimum number of fruits that Cara wants to eat (***m***), a list of fruits that she has, and their respective days of peak ripeness, output the maximum number of days ***d*** such that she can come up with a schedule where each eats at least ***m*** fruits such that there are at least ***d*** days between any two fruits that Cara eats.

The Input

The first line of input will contain a single positive integer, ***c*** ($\boldsymbol{c} \leq 20$), representing the number of input cases to process. The input cases follow.

Each case will begin with two spaces separated integers on a line: ***n*** ($1 \leq \boldsymbol{n} \leq 300{,}000$) and ***m*** ($2 \leq \boldsymbol{m} \leq \boldsymbol{n}$), representing the number of fruits that Cara has and the minimum number of fruits that Cara wants to eat. The following ***n*** lines will each contain an integer ***p*** ($1 \leq \boldsymbol{p} \leq 10^{18}$), the day of peak ripeness for each of Cara's fruits.

The Output

For each query, output ***d***, the maximum number of days such that Cara eats at least ***m*** fruits and no two fruits are eaten less than ***d*** days apart.

Sample Input

```
3
5 3
4
5
6
7
8
7 4
1
2
5
9
14
18
6
5 4
1000
2
2
2
4
```

Sample Output

```
2
4
0
```

Note: The last example illustrates that it's possible that more than 1 of the fruits Cara has may ripen on the same day and that in the worst case, Cara may be forced to eat more than 1 fruit in a single day, which means that the maximum gap she could guarantee between fruits is 0 days.