6290. Maximize the Minimum Powered City

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Difficulty:	Hard

You are given a **0-indexed** integer array `stations` of length `n`, where `stations[i]` represents the number of power stations in the i^{th} city.

Each power station can provide power to every city in a fixed **range**. In other words, if the range is denoted by `r`, then a power station at city `i` can provide power to all cities `j` such that `|i - j| <= r` and `0 <= i, j <= n - 1`.

- Note that `|x|` denotes **absolute** value. For example, `|7 - 5| = 2` and `|3 - 10| = 7`.

The **power** of a city is the total number of power stations it is being provided power from.

The government has sanctioned building `k` more power stations, each of which can be built in any city, and have the same range as the pre-existing ones.

Given the two integers `r` and `k`, return *the* ***maximum possible minimum power*** *of a city, if the additional power stations are built optimally.*

Note that you can build the `k` power stations in multiple cities.

Example 1:

```
Input: stations = [1,2,4,5,0], r = 1, k = 2
Output: 5
Explanation:
One of the optimal ways is to install both the power stations at city 1.
So stations will become [1,4,4,5,0].
- City 0 is provided by 1 + 4 = 5 power stations.
- City 1 is provided by 1 + 4 + 4 = 9 power stations.
- City 2 is provided by 4 + 4 + 5 = 13 power stations.
- City 3 is provided by 5 + 4 = 9 power stations.
- City 4 is provided by 5 + 0 = 5 power stations.
So the minimum power of a city is 5.
Since it is not possible to obtain a larger power, we return 5.
```

Example 2:

```
Input: stations = [4,4,4,4], r = 0, k = 3
Output: 4
Explanation:
It can be proved that we cannot make the minimum power of a city greater than 4.
```

Constraints:

- `n == stations.length`
- `1 <= n <=` 10^5
- `0 <= stations[i] <=` 10^5
- `0 <= r <= n - 1`
- `0 <= k <=` 10^9

JavaScript

```
const preSum = (a) => { let pre = [0]; for (let i = 0; i < a.length; i++) { pre.push(pre[i] + a[i]); } return pre; };
const subArraySum = (a, l, r) => a[r + 1] - a[l];

let a, n, r, k, pre, p;
const maxPower = (A, R, K) => {
    a = A, r = R, k = K, n = a.length, pre = preSum(a), p = compute();
    return BinarySearch(0, 2e10);
};

const compute = () => {
    let p = Array(n).fill(0);
    for (let i = 0; i < n; i++) {
        let L = Math.max(0, i - r), R = Math.min(n - 1, i + r);
        let rangeSum = subArraySum(pre, L, R);
        p[i] = rangeSum;
    }
    return p;
};

const BinarySearch = (low, high) => {
    while (low <= high) {
        let mid = low + parseInt((high - low) / 2);
        if (possible(mid)) {
            low = mid + 1;
        } else {
            high = mid - 1;
        }
    }
    return high;
};

const cover = (r) => 2 * r + 1;

const possible = (v) => {
    let d = Array(n + 1).fill(0), cur = 0, sum = 0;
    for (let i = 0; i < n; i++) {
        cur += d[i];
        if (cur + p[i] < v) {
            let needPower = v - p[i] - cur;
            sum += needPower;
            let idx = Math.min(i + cover(r), n);
            d[idx] -= needPower;
            cur += needPower;
        }
    }
    return sum <= k;
};
```

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