

Problem 3017: Count the Number of Houses at a Certain Distance II

Problem Information

Difficulty: Hard

Acceptance Rate: 23.04%

Paid Only: No

Tags: Graph, Prefix Sum

Problem Description

You are given three **positive** integers `n`, `x`, and `y`.

In a city, there exist houses numbered `1` to `n` connected by `n` streets. There is a street connecting the house numbered `i` with the house numbered `i + 1` for all `1 <= i <= n - 1` . An additional street connects the house numbered `x` with the house numbered `y` .

For each `k` , such that `1 <= k <= n` , you need to find the number of **pairs of houses** `(house1, house2)` such that the **minimum** number of streets that need to be traveled to reach `house2` from `house1` is `k` .

Return **a^{1-indexed}** array **_result** **_of length_** `n` **_where_** `result[k]` **_represents** the **total** number of pairs of houses such that the **minimum** streets required to reach one house from the other is **_k** .

Note that `x` and `y` can be **equal**.

Example 1:

Input: n = 3, x = 1, y = 3 **Output:** [6,0,0] **Explanation:** Let's look at each pair of houses:
- For the pair (1, 2), we can go from house 1 to house 2 directly.
- For the pair (2, 1), we can go from house 2 to house 1 directly.
- For the pair (1, 3), we can go from house 1 to house 3 directly.
- For the pair (3, 1), we can go from house 3 to house 1 directly.
- For the pair (2, 3), we can go from house 2 to house 3 directly.
- For the pair (3, 2), we can go from

house 3 to house 2 directly.

****Example 2:****

****Input:**** n = 5, x = 2, y = 4 ****Output:**** [10,8,2,0,0] ****Explanation:**** For each distance k the pairs are: - For k == 1, the pairs are (1, 2), (2, 1), (2, 3), (3, 2), (2, 4), (4, 2), (3, 4), (4, 3), (4, 5), and (5, 4). - For k == 2, the pairs are (1, 3), (3, 1), (1, 4), (4, 1), (2, 5), (5, 2), (3, 5), and (5, 3). - For k == 3, the pairs are (1, 5), and (5, 1). - For k == 4 and k == 5, there are no pairs.

****Example 3:****

****Input:**** n = 4, x = 1, y = 1 ****Output:**** [6,4,2,0] ****Explanation:**** For each distance k the pairs are: - For k == 1, the pairs are (1, 2), (2, 1), (2, 3), (3, 2), (3, 4), and (4, 3). - For k == 2, the pairs are (1, 3), (3, 1), (2, 4), and (4, 2). - For k == 3, the pairs are (1, 4), and (4, 1). - For k == 4, there are no pairs.

****Constraints:****

* `2 <= n <= 105` * `1 <= x, y <= n`

Code Snippets

C++:

```
class Solution {
public:
    vector<long long> countOfPairs(int n, int x, int y) {
        }
};
```

Java:

```
class Solution {
    public long[] countOfPairs(int n, int x, int y) {
```

```
    }  
}
```

Python3:

```
class Solution:  
    def countOfPairs(self, n: int, x: int, y: int) -> List[int]:
```