

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 $1 \leq i \leq n - 1$. An additional street connects the house numbered x with the house numbered y .

For each k , such that $1 \leq k \leq n$, 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:

$2 \leq n \leq 10^5$ $1 \leq x, y \leq n$

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]:
```