# BST maintenance

HackerRank

Consider a binary search tree $T$ which is initially empty. Also, consider the first `N` positive integers {1, 2, 3, 4, 5, ....., N} and its permutation P $\{a_1, a_2, \ldots, a_N\}$.

If we start adding these numbers to the binary search tree $T$, starting from $a_1$, continuing with $a_2$, ... (and so on) ..., ending with $a_N$. After every addition we ask you to output the sum of distances between every pair of $T$'s nodes.

**Input Format**
The first line of the input consists of the single integer **N**, the size of the list.
The second line of the input contains **N** single space separated numbers the permutation $a_1, a_2, \ldots, a_N$ itself.

**Constraints**
$1 \le N \le 250000$

**Output Format**
Output $N$ lines.
On the $i^{th}$ line output the sum of distances between every pair of nodes after adding the first $i$ numbers from the permutation to the binary search tree $T$

**Sample Input #00**

```
8
4 7 3 1 8 2 6 5
```

**Sample Output #00**

```
0
1
4
10
20
35
52
76
```

**Explanation #00**

After adding the first element, the distance is `0` as there is only 1 element

```
4
```

After adding the second element, the distance between 2 nodes is `1`.

```
4
 \
  7
```

After adding the third element, the distance between every pair of elements is `2+1+1=4`

```
  4
 / \
3   7
```

After adding the fourth element, the distance between every pair of elements is `3 + 2 + 1 + 2 + 1 + 1 = 10`

```
    4
   / \
  3   7
 /
1
```

After adding the fifth element, the distance between every pair of elements is `4 + 3 + 2 + 1 + 3 + 2 + 1 + 2 + 1 + 1 = 20`

```
    4
   / \
  3   7
 /     \
1       8
```

After adding the sixth element, the distance between every pair of elements is `5 + 4 + 3 + 2 + 1 + 4 + 3 + 2 + 1 + 3 + 2 + 1 + 2 + 1 + 1 = 35`

```
    4
   / \
  3   7
 /     \
1       8
 \
  2
```

After adding the seventh element, the distance between every pair of elements is `5+5+4+3+2+1+4+4+3+2+1+3+3+2+1+2+2+1+1+1+2=52`

```
    4
   / \
  3   7
 /   / \
1   6   8
 \
  2
```

After adding the final element, the distance between every pair of elements is `6+5+5+4+3+2+1+5+4+4+3+2+1+4+3+3+2+1+3+2+2+1+2+1+1+2+1+3=76`

```
        4
      /   \
    3       7
  /       /   \
1       6       8
```

```
  \     /
   2   5
```