Dynamic Minimum Difference in a BST

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Points: 100 (partial)
Time limit: 1.0s
Memory limit: 256M

Allowed languages
C

You are given an **initially empty Binary Search Tree (BST)**. You need to insert nodes one by one, and after each insertion, print the minimum absolute difference between values of any two nodes in the BST. It is guranteed that all the values to be inserted will be unique and between 1 and 10^9.

Input Format

- The **first line** contains a single integer `n`, the number of insertions to be made in the tree.
- The **second line** contains `n` space-separated integers representing the values to be inserted in the tree.

Output Format

After every insertion print the minimum absolute difference between any two values in the tree. Since there is only one value in the tree after the first insertion print `-1` instead.

Constraints:

- Batch 1: 1<=N<=1e3
- Batch 2: 1<=N<=1e5

Samples

Input

Copy

```
5
4 2 6 1 3
```

```
-1 2 2 1 1
```

Copy

Input

```
8
5 1 9 15 21 18 12 6
```

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Output

```
-1 4 4 4 4 3 3 1
```

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Input

```
5
10 4 16 22 8
```

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Output

```
-1 6 6 6 2
```

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Clarifications

Request clarification

No clarifications have been made at this time.