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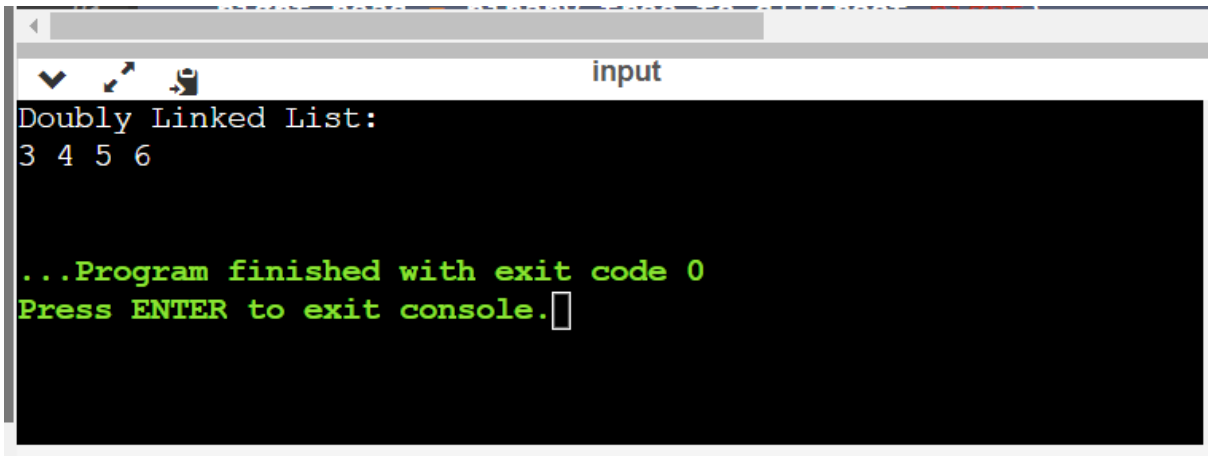
Day-19

Problem 1: Binary Tree to Double Linked List

```
class Node:
    def __init__(self, data):
        self.data = data
        self.left = None
        self.right = None

def binary_tree_to_dll(root):
    if root is None:
        return None

    left_head = binary_tree_to_dll(root.left)

    while left_head is not None and left_head.right is not None:
        left_head = left_head.right

    if left_head is not None:
        left_head.right = root
        root.left = left_head

    right_head = binary_tree_to_dll(root.right)

    if right_head is not None:
        right_head.left = root
        root.right = right_head

    return root if root.left is None else root.left

def print_dll(head):
    while head is not None:
        print(head.data, end=" ")
```

```
        head = head.right
    print()


root = Node(4)
root.left = Node(2)
root.right = Node(5)
root.left.left = Node(1)
root.left.right = Node(3)
root.right.right = Node(6)


dll_head = binary_tree_to_dll(root)


print("Doubly Linked List:")
print_dll(dll_head)
```

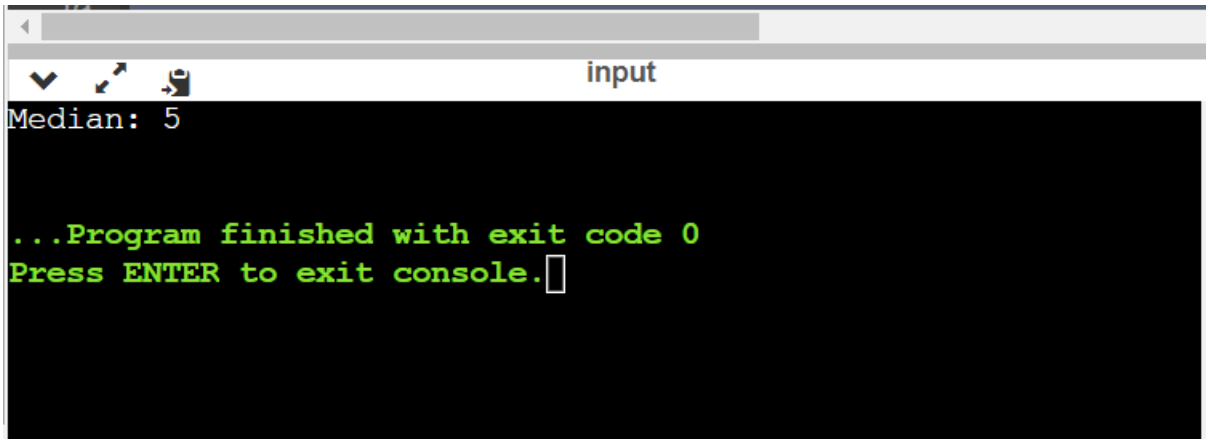


Problem 2: Find median in a stream of running integer

```
    class TreeNode:
    def __init__(self, val):
        self.val = val
        self.left = None
        self.right = None



class MedianFinder:
    def __init__(self):
        self.root = None
        self.count = 0

    def addNum(self, num):
        if self.root is None:
            self.root = TreeNode(num)
        else:
            self._insert(self.root, num)

        self.count += 1

    def _insert(self, node, num):
        if num < node.val:
            if node.left is None:
                node.left = TreeNode(num)
            else:
                self._insert(node.left, num)
        else:
            if node.right is None:
                node.right = TreeNode(num)
            else:
```

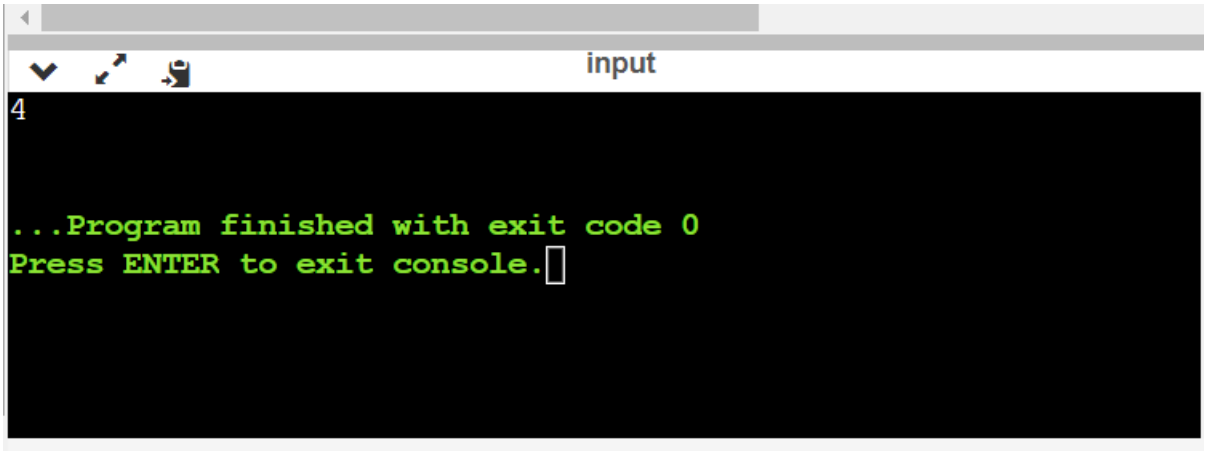
```
            self._insert(node.right, num)

    def findMedian(self):
        if self.count == 0:
            return None

        if self.count % 2 == 1:
            return self._find_kth_smallest(self.root, (self.count + 1) // 2)
        else:
            left = self._find_kth_smallest(self.root, self.count // 2)
            right = self._find_kth_smallest(self.root, self.count // 2 + 1)
            return (left + right) / 2

    def _find_kth_smallest(self, node, k):
        left_count = self._count_nodes(node.left)

        if k == left_count + 1:
            return node.val
        elif k <= left_count:
            return self._find_kth_smallest(node.left, k)
        else:
            return self._find_kth_smallest(node.right, k - left_count - 1)

    def _count_nodes(self, node):
        if node is None:
            return 0
        return 1 + self._count_nodes(node.left) + self._count_nodes(node.right)

mf = MedianFinder()
mf.addNum(5)
mf.addNum(10)
```

```
mf.addNum(1)

mf.addNum(7)

mf.addNum(3)

median = mf.findMedian()

print("Median:", median)
```



Problem 3: Find K-th largest element in a stream

```
import heapq

class TreeNode:
    def __init__(self, val):
        self.val = val
        self.left = None
        self.right = None

class KthLargest:
    def __init__(self, k, nums):
        self.k = k
        self.heap = []
        for num in nums:
            self.add(num)

    def add(self, val):
        if len(self.heap) < self.k:
            heapq.heappush(self.heap, val)
        else:
            heapq.heappushpop(self.heap, val)

    def find_kth_largest(self):
        return self.heap[0]

# Test case
nums = [4, 5, 8, 2]
k = 3

kth_largest = KthLargest(k, nums)
print(kth_largest.find_kth_largest())
```


input
4
...Program finished with exit code 0
Press ENTER to exit console.

Problem 4: Distinct numbers in Window

```
class TreeNode:
    def __init__(self, value):
        self.value = value
        self.left = None
        self.right = None

def distinctNumbersInWindow(root, window_size):
    distinct_numbers = set()
    window_numbers = set()

    def traverse(node):
        if not node:
            return

        window_numbers.add(node.value)
        distinct_numbers.add(node.value)

        if len(window_numbers) > window_size:
            window_numbers.remove(node.value)

        traverse(node.left)
        traverse(node.right)

    traverse(root)
    return len(distinct_numbers)

root = TreeNode(1)
root.left = TreeNode(2)
root.right = TreeNode(3)
root.left.left = TreeNode(2)
```

root.left.right = TreeNode(4)

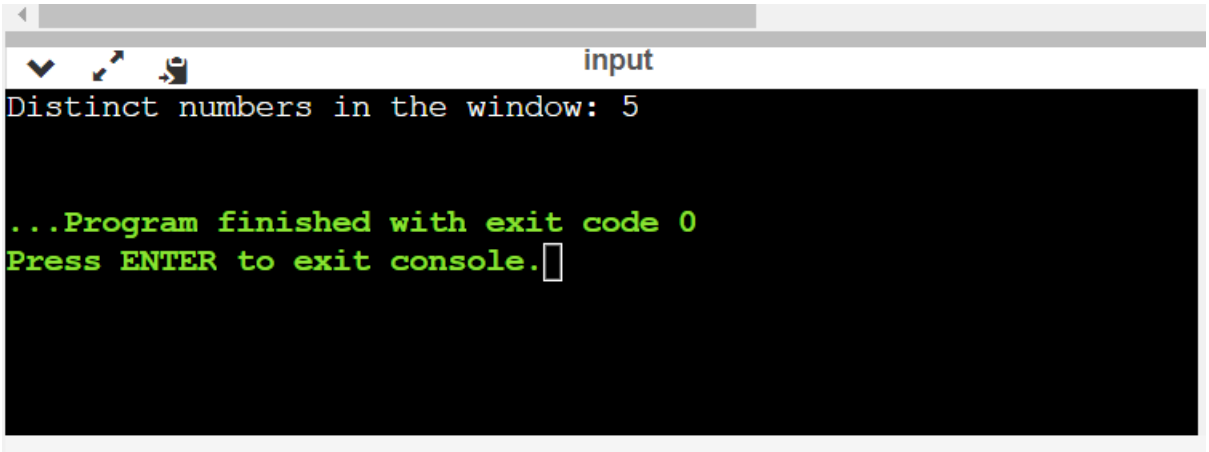
root.right.left = TreeNode(3)

root.right.right = TreeNode(5)

window_size = 3

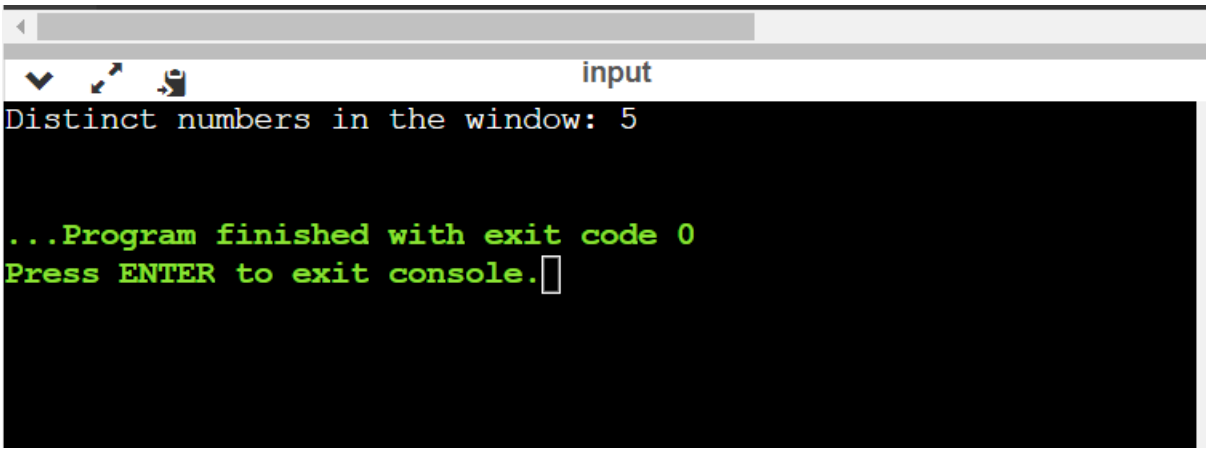
distinct_count = distinctNumbersInWindow(root, window_size)

print("Distinct numbers in the window:", distinct_count)



Problem 5: K-th largest element in an unsorted array.

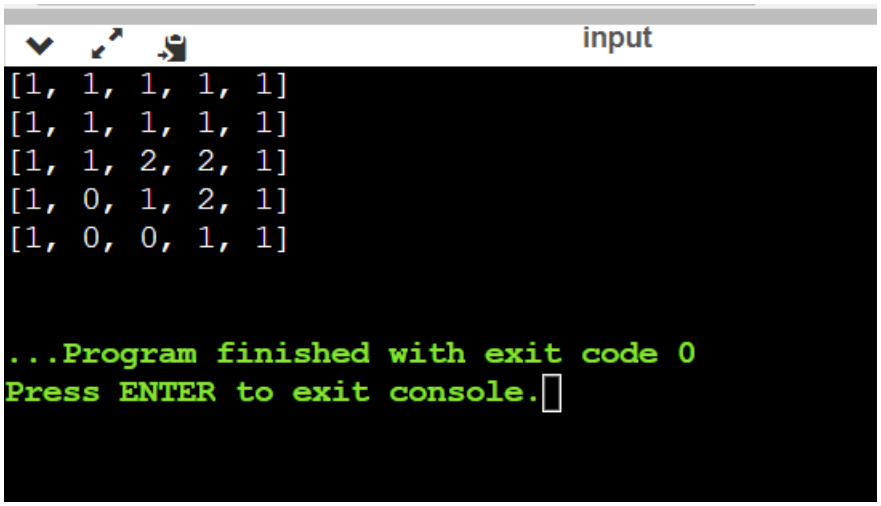
```
def find_kth_largest(nums, k):
    nums.sort(reverse=True)
    return nums[k - 1]


arr = [3, 1, 5, 2, 4]
k_value = 2
kth_largest = find_kth_largest(arr, k_value)
print(f"The {k_value}th largest element is: {kth_largest}")
```



Problem 6: Flood-fill Algorithm

```
def flood_fill(image, sr, sc, new_color):
    if image[sr][sc] == new_color:
        return image

    rows, cols = len(image), len(image[0])
    original_color = image[sr][sc]

    def dfs(row, col):
        if (
            row < 0
            or row >= rows
            or col < 0
            or col >= cols
            or image[row][col] != original_color
        ):
            return

        image[row][col] = new_color
        dfs(row + 1, col)
        dfs(row - 1, col)
        dfs(row, col + 1)
        dfs(row, col - 1)
```

```
    dfs(sr, sc)
    return image


image = [
    [1, 1, 1, 1, 1],
    [1, 1, 1, 1, 1],
    [1, 1, 0, 0, 1],
    [1, 0, 1, 0, 1],
    [1, 0, 0, 1, 1],
]

sr = 2
sc = 2
new_color = 2

filled_image = flood_fill(image, sr, sc, new_color)
for row in filled_image:
    print(row)
```


input
[1, 1, 1, 1, 1]
[1, 1, 1, 1, 1]
[1, 1, 2, 2, 1]
[1, 0, 1, 2, 1]
[1, 0, 0, 1, 1]
...Program finished with exit code 0
Press ENTER to exit console.