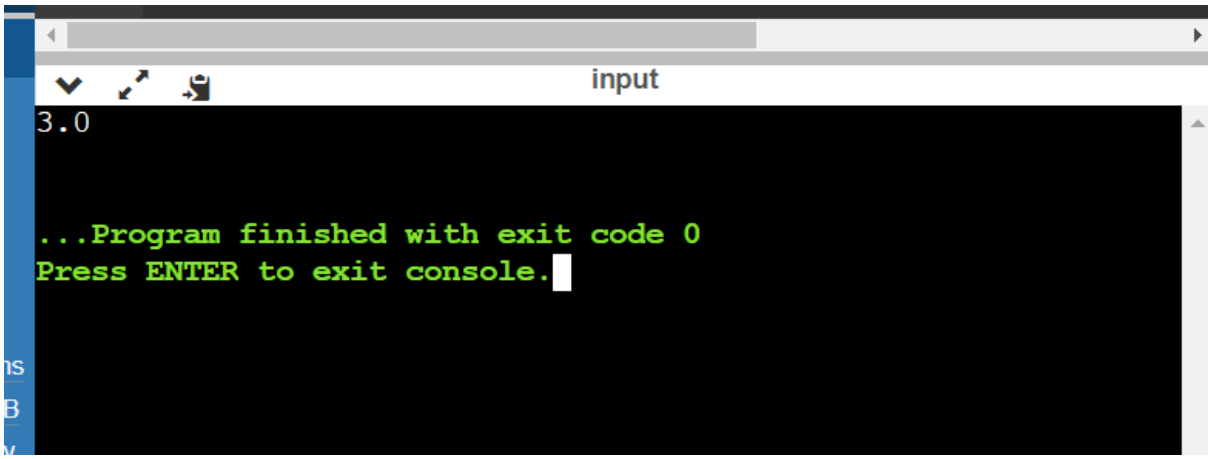
Day – 11 Binary Search

Problem Statement: Given two numbers N and M, find the Nth root of M.

The nth root of a number M is defined as a number X when raised to the power N equals M.

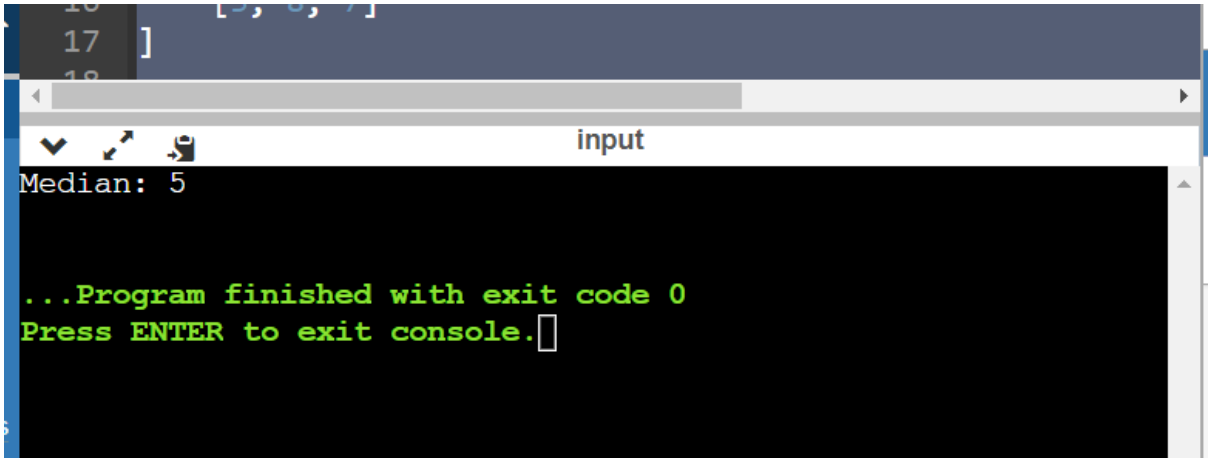
```
def find_nth_root(N, M):
    X = M ** (1/N)
    return X


N = 3
M = 27
result = find_nth_root(N, M)
print(result)
```



Problem Statement: Given a row-wise sorted matrix of size r*c, where r is no. of rows and c is no. of columns, find the median in the given matrix.

```
def find_median(matrix):
    rows, cols = len(matrix), len(matrix[0])
    arr = []
```

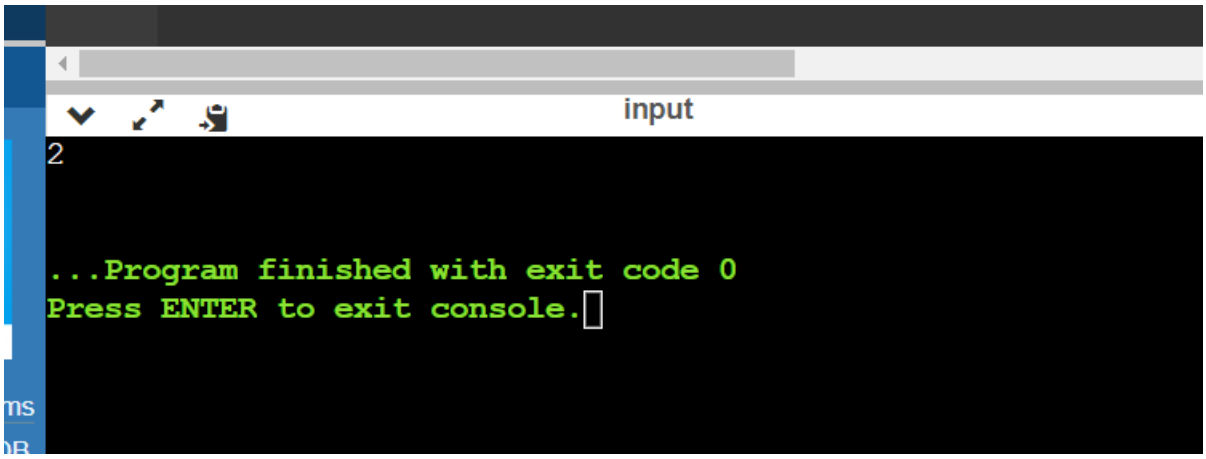
```
    for i in range(rows):
        for j in range(cols):
            arr.append(matrix[i][j])

    arr.sort()
    middle_idx = len(arr) // 2
    median = arr[middle_idx]

    return median
matrix = [
    [1, 4, 9],
    [2, 5, 6],
    [3, 8, 7]
]

median = find_median(matrix)
print("Median:", median)
```



Problem Statement: Given a sorted array of N integers, where every element except one appears exactly twice and one element appears only once. Search Single Element in a sorted array.

```
def find_single_element(arr):
    left, right = 0, len(arr) - 1
```

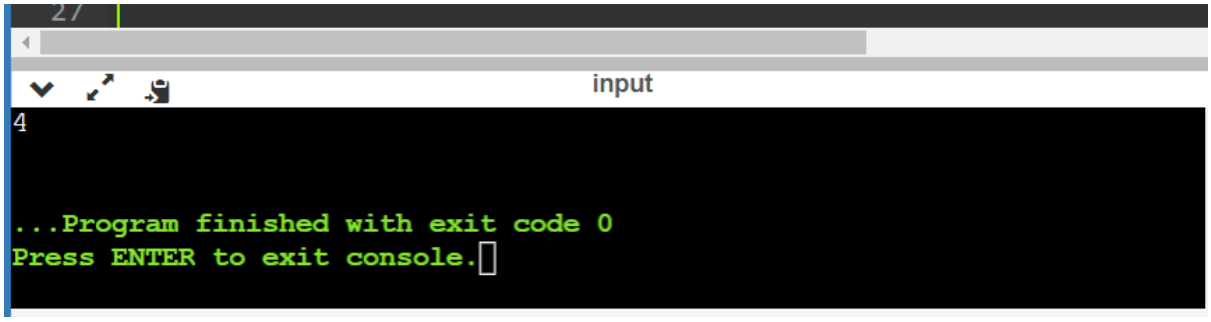
```
    while left < right:
        mid = left + (right - left) // 2
        if mid % 2 == 1:
            mid -= 1

        if arr[mid] == arr[mid + 1]:
            left = mid + 2
        else:
            right = mid
    return arr[left]
arr = [1, 1, 2, 3, 3, 4, 4, 8, 8]
print(find_single_element(arr))
```



Problem Statement: Given an integer array arr of size N, sorted in ascending order (with distinct values) and a target value k. Now the array is rotated at some pivot point unknown to you. Find the index at which k is present and if k is not present return -1.

```
def find_target_index(arr, k):
    low, high = 0, len(arr) - 1

    while low <= high:
        mid = (low + high) // 2
```

```
        if arr[mid] == k:
            return mid

        if arr[low] <= arr[mid]:
            if arr[low] <= k <= arr[mid]:
                high = mid - 1
            else:
                low = mid + 1
        else:
            if arr[mid] <= k <= arr[high]:
                low = mid + 1
            else:
                high = mid - 1

    return -1
arr = [4, 5, 6, 7, 0, 1, 2, 3]
k = 0

index = find_target_index(arr, k)
print(index)
```

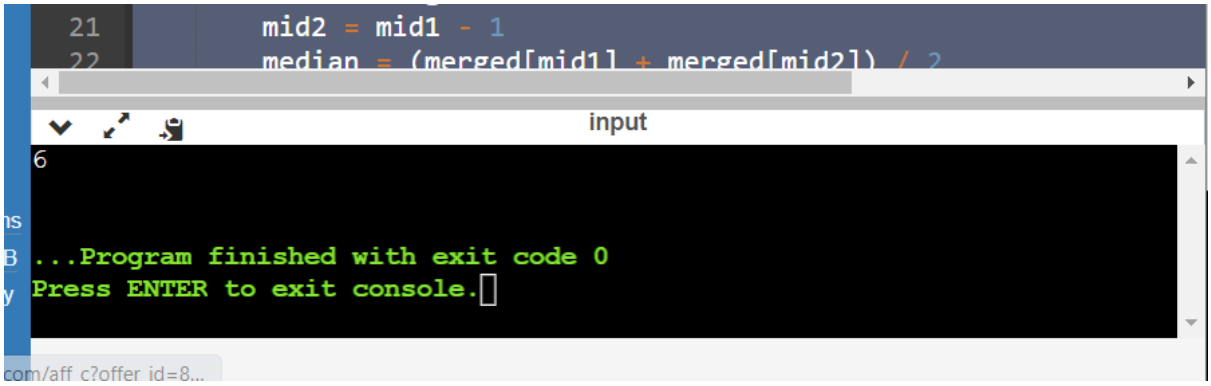


Problem Statement: Given **two sorted arrays** arr1 and arr2 of size m and n respectively, return the **median** of the two sorted arrays.

```
def findMedianSortedArrays(arr1, arr2):
```

```
merged = []
i, j = 0, 0
while i < len(arr1) and j < len(arr2):
    if arr1[i] <= arr2[j]:
        merged.append(arr1[i])
        i += 1
    else:
        merged.append(arr2[j])
        j += 1
while i < len(arr1):
    merged.append(arr1[i])
    i += 1
while j < len(arr2):
    merged.append(arr2[j])
    j += 1

length = len(merged)
if length % 2 == 0:
    mid1 = length // 2
    mid2 = mid1 - 1
    median = (merged[mid1] + merged[mid2]) / 2
else:
    mid = (length - 1) // 2
```

```
        median = merged[mid]


    return median

arr1 = [1, 4, 7, 10, 12]

arr2 = [2, 3, 6, 15]


median = findMedianSortedArrays(arr1, arr2)

print(median)
```



Problem Statement: Given **two sorted arrays** of size **m** and **n** respectively, you are tasked with finding the element that would be at the **kth position** of the **final sorted array**.

```
def find_kth_element(array1, array2, k):
    m, n = len(array1), len(array2)
    i, j = 0, 0
    count = 0

    while i < m and j < n:
        if array1[i] <= array2[j]:
            current_element = array1[i]
            i += 1
```

```
        else:
            current_element = array2[j]
            j += 1

        count += 1
        if count == k:
            return current_element

    while i < m:
        count += 1
        if count == k:
            return array1[i]
        i += 1
    while j < n:
        count += 1
        if count == k:
            return array2[j]
        j += 1

    return "Error: k exceeds the total number of elements."



array1 = [2, 3, 6, 7, 9]
array2 = [1, 4, 8, 10]
k = 5
result = find_kth_element(array1, array2, k)
print(result)
```

```
36 print(result)
37
```

input

```
6

...Program finished with exit code 0
Press ENTER to exit console.
```