TOPIC 2: BRUTE FORCE ALGORITHM

1. List Examples

Aim: Demonstrate different types of lists.

Algorithm:

1. Create an empty list.
2. Create a list with one element.
3. Create a list with all identical elements.
4. Create a list with negative numbers and sort it.

Python code:

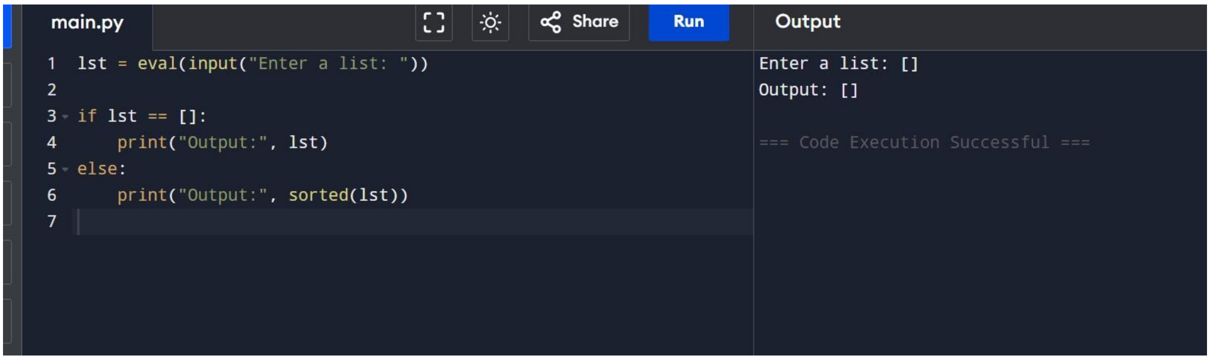
```
lst = eval(input("Enter a list: ")) if
lst == []:
   print("Output:", lst) else:
   print("Output:", sorted(lst))
```

Input:

[]

Output:

[]



```
lst = eval(input("Enter a list: "))

if lst == []:
    print("Output:", lst)
else:
    print("Output:", sorted(lst))
```

```
Enter a list: []
Output: []

=== Code Execution Successful ===
```

2. Selection Sort

Aim: Sort an array using Selection Sort.

Algorithm:

1. Divide the array into sorted and unsorted parts.
2. Find the minimum element in the unsorted part.
3. Swap it with the first element of the unsorted part.
4. Repeat until the array is fully sorted.

Python Code:

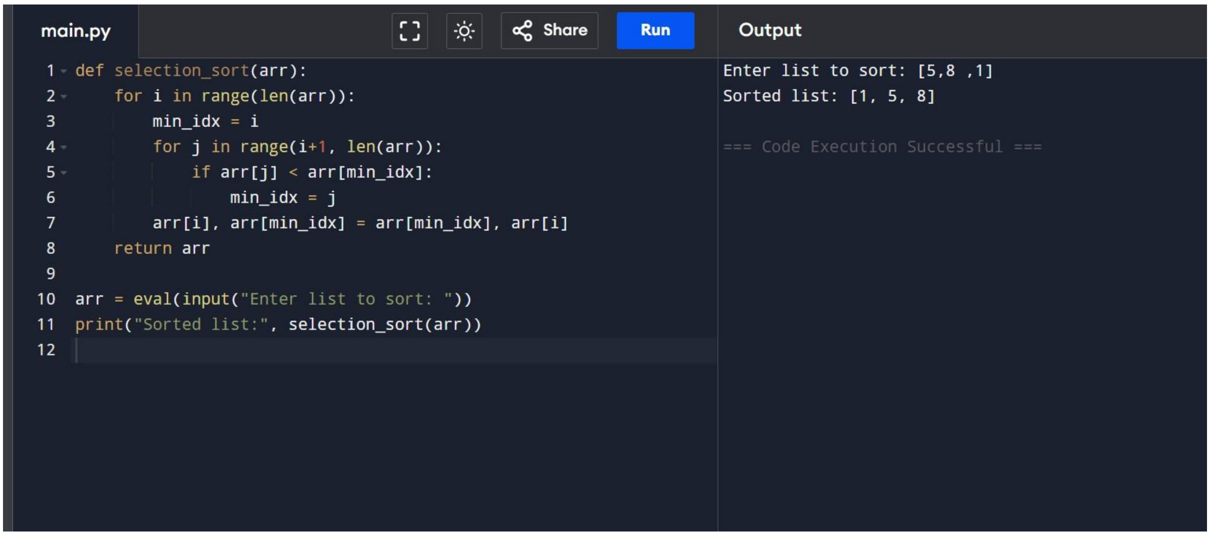
```
def selection_sort(arr):
for i in range(len(arr)):
    min_idx = i         for j in
range(i+1, len(arr)):           if
arr[j] < arr[min_idx]:
          min_idx = j         arr[i],
arr[min_idx] = arr[min_idx], arr[i]     return
arr

arr = eval(input("Enter list to sort: ")) print("Sorted
list:", selection_sort(arr))
```

Input:

[5, 2, 9, 1, 5, 6]

Output:

[1, 2, 5, 5, 6, 9]



```
def selection_sort(arr):
    for i in range(len(arr)):
        min_idx = i
        for j in range(i+1, len(arr)):
            if arr[j] < arr[min_idx]:
                min_idx = j
        arr[i], arr[min_idx] = arr[min_idx], arr[i]
    return arr

arr = eval(input("Enter list to sort: "))
print("Sorted list:", selection_sort(arr))
```

```
Enter list to sort: [5,8 ,1]
Sorted list: [1, 5, 8]

=== Code Execution Successful ===
```

3. Optimized Bubble Sort

Aim: Stop Bubble Sort early if the list is already sorted.

Algorithm:

1. Compare adjacent elements and swap if needed.
2. If no swaps occur in a pass, the list is sorted.

Python Code:

```
def bubble_sort(arr):     n = len(arr)
for i in range(n):         swapped = False
for j in range(0, n-i-1):             if arr[j] >
arr[j+1]:                 arr[j], arr[j+1] =
arr[j+1], arr[j]                 swapped = True
if not swapped:
            break
return arr


arr = eval(input("Enter list to sort: "))
print("Sorted list:", bubble_sort(arr))
```

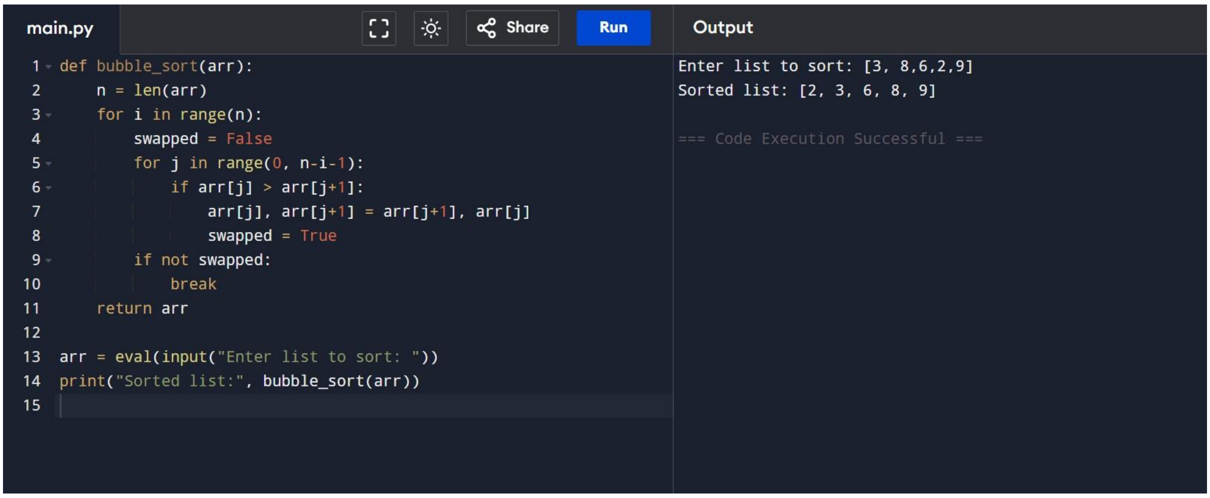
Input:

```
[64, 25, 12, 22, 11]
[29, 10, 14, 37, 13]
[3, 5, 2, 1, 4]
[1, 2, 3, 4, 5]
[5, 4, 3, 2, 1]
```

Output:

```
[11, 12, 22, 25, 64]
[10, 13, 14, 29, 37]
[1, 2, 3, 4, 5]
[1, 2, 3, 4, 5]
```

[1, 2, 3, 4, 5]



```
def bubble_sort(arr):
    n = len(arr)
    for i in range(n):
        swapped = False
        for j in range(0, n-i-1):
            if arr[j] > arr[j+1]:
                arr[j], arr[j+1] = arr[j+1], arr[j]
                swapped = True
        if not swapped:
            break
    return arr

arr = eval(input("Enter list to sort: "))
print("Sorted list:", bubble_sort(arr))
```

```
Enter list to sort: [3, 8,6,2,9]
Sorted list: [2, 3, 6, 8, 9]

=== Code Execution Successful ===
```

4. Insertion Sort with Duplicates Aim:

Sort arrays including duplicates.

Algorithm:

1. Take one element at a time and insert it in its correct position in the sorted part.
2. Relative order of duplicates is preserved.

Python Code:

```
def insertion_sort(arr):
   for i in range(1, len(arr)):
      key = arr[i]      j = i - 1
while j >= 0 and arr[j] > key:
         arr[j + 1] = arr[j]
j -= 1
      arr[j + 1] = key
return arr


arr = eval(input("Enter list to sort: ")) print("Sorted
list:", insertion_sort(arr))
```

Input:

[3, 1, 4, 1, 5, 9, 2, 6, 5, 3]

[5, 5, 5, 5, 5] [2, 3,

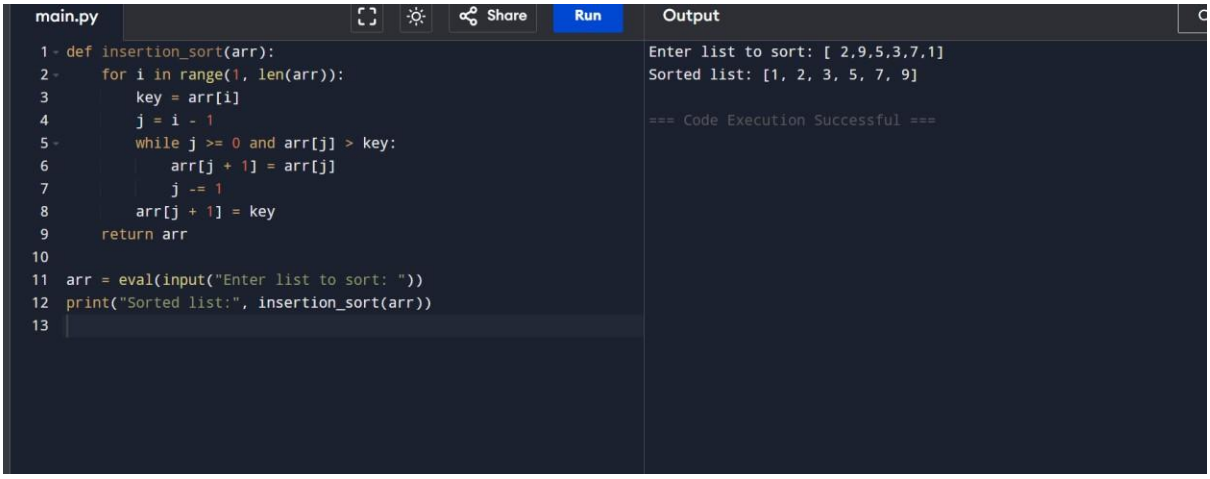
1, 3, 2, 1, 1, 3]

Output:

[1, 1, 2, 3, 3, 4, 5, 5, 6, 9]

[5, 5, 5, 5, 5]

[1, 1, 1, 2, 2, 3, 3, 3]



```
def insertion_sort(arr):
    for i in range(1, len(arr)):
        key = arr[i]
        j = i - 1
        while j >= 0 and arr[j] > key:
            arr[j + 1] = arr[j]
            j -= 1
        arr[j + 1] = key
    return arr

arr = eval(input("Enter list to sort: "))
print("Sorted list:", insertion_sort(arr))
```

```
Enter list to sort: [ 2,9,5,3,7,1]
Sorted list: [1, 2, 3, 5, 7, 9]

=== Code Execution Successful ===
```

5. Kth Missing Positive

Aim: Find the kth missing positive number.

Algorithm:

1. Start from 1 and check each number.
2. Count missing numbers until k is reached.

Python Code:

```
def findKthPositive(arr, k):
   missing = []     current
= 1     while len(missing)
< k:        if current not in
arr:
            missing.append(current)
current += 1     return missing[-
1]
```

arr = eval(input("Enter sorted list: ")) k = int(input("Enter k: ")) print("Kth Missing Positive Number:", findKthPositive(arr, k))

Input:

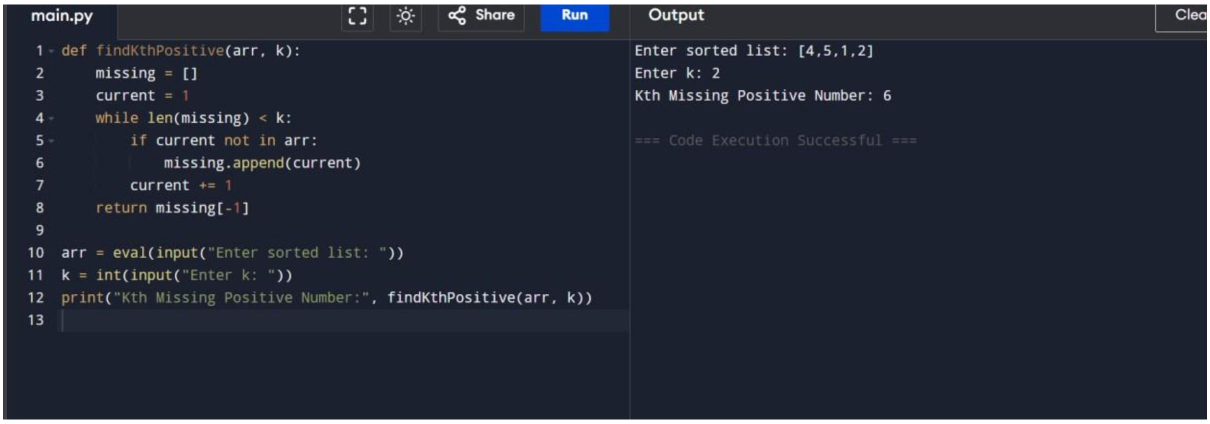
[2,3,4,7,11], k=5

[1,2,3,4], k=2

Output:

9

6



```
def findKthPositive(arr, k):
    missing = []
    current = 1
    while len(missing) < k:
        if current not in arr:
            missing.append(current)
        current += 1
    return missing[-1]

arr = eval(input("Enter sorted list: "))
k = int(input("Enter k: "))
print("Kth Missing Positive Number:", findKthPositive(arr, k))
```

```
Enter sorted list: [4,5,1,2]
Enter k: 2
Kth Missing Positive Number: 6

=== Code Execution Successful ===
```