

**1. Write a program to implement linear search algorithm Repeat the experiment for different values of n, the number of elements in the list to be searched and plot a graph of the time taken versus n.**

```
import time
import matplotlib.pyplot as plt

def linearsearch(arr,n, key):
    for i in range(n):
        if arr[i]==key:
            return i+1
    return -1

def linear_search_n(r):
    results=[]
    for _ in range(r):
        n=int(input("Enter the number of elements: "))
        arr=list(map(int,input("\n Enter the elements of an array:").split()))
        key=int(input("\nEnter the key element to be searched:"))
        repeat=10000
        result=-1
        start=time.time()
        for _ in range(repeat):
            result=linearsearch(arr,n,key)
        end=time.time()
        if result!=-1:
            print(f"key {key} found at position {result}")
        else:
            print(f"key {key} not found")
        time_taken=(end-start)*1000
        print(f"Time taken to search a key element= {time_taken} milli seconds")
        results.append((n,time_taken))
    return results
```

```

def plot_results(results):
    n_values=[result[0] for result in results]
    times= [result[1] for result in results]
    plt.figure()
    plt.plot(n_values,times,'o-')
    plt.xlabel('Number of elements (n)')
    plt.ylabel('Time taken (milli seconds)')
    plt.title('Linear Search Time Complexity')
    plt.grid(True)
    plt.show()

r=int(input("Enter the number of runs: "))
results=linear_search_n(r)
plot_results(results)

```

## Output

Enter the number of runs: 3

Enter the number of elements: 15

Enter the elements of an array:150 140 130 120 101 99 34 20 30 40 50 60 49 70 68

Enter the key element to be searched:68

key 68 found at position 15

Time taken to search a key element= 17.982959747314453 milli seconds

Enter the number of elements: 10

Enter the elements of an array:30 40 50 60 70 80 90 20 10 100

Enter the key element to be searched:100

key 100 found at position 10

Time taken to search a key element= 12.996196746826172 milli seconds

Enter the number of elements: 5

Enter the elements of an array:30 49 50 69 54

Enter the key element to be searched:54

key 54 found at position 5

Time taken to search a key element= 9.970664978027344 milli seconds

