```
#Merge_sort
import time
start=time.time()
import matplotlib.pyplot as plt
def merge(left,right):
    result=[]
    i,j=0,0
    while i<len(left) and j<len(right):
        if left[i]<right[j]:
            result.append(left[i])
            i+=1
        else:
            result.append(right[j])
            j+=1
    result.extend(left[i:])
    result.extend(right[j:])
    return result

def merge_sort(list):
    if len(list)<=1:
        return list
    mid=int(len(list)/2)

    left=merge_sort(list[:mid])
    right=merge_sort(list[mid:])
    return merge(left,right)

list=[7,2,5,3,4,1,2,8]
print("Before sorting the list:")
print(list)
print("\n")

x_axis=[]
y_axis=[]

for k in range(1,2000,100):
    result=merge_sort(list)
    print("Run time of program:",round(time.time()-start,6))
    x_axis.append(k*100)
    y_axis.append(round(time.time()-start,6))

print("After sorting the elements:")
print(result)

plt.plot(x_axis,y_axis,marker="o")
plt.title("merge sort time complexity is O(n*logn)")
plt.xlabel("input")
plt.ylabel("time")
plt.show()
**************************output**************************************
*****
Before sorting the list:
[7, 2, 5, 3, 4, 1, 2, 8]
```

```
Run time of program: 0.557701
Run time of program: 0.56746
Run time of program: 0.576449
Run time of program: 0.587987
Run time of program: 0.599229
Run time of program: 0.60868
Run time of program: 0.620689
Run time of program: 0.633181
Run time of program: 0.642238
Run time of program: 0.654461
Run time of program: 0.666465
Run time of program: 0.675462
Run time of program: 0.687493
Run time of program: 0.698463
Run time of program: 0.707493
Run time of program: 0.719461
Run time of program: 0.731471
Run time of program: 0.741462
Run time of program: 0.753491
Run time of program: 0.765463
After sorting the elements:
[1, 2, 2, 3, 4, 5, 7, 8]
```