Khushi Chhatwani CSC/21/55

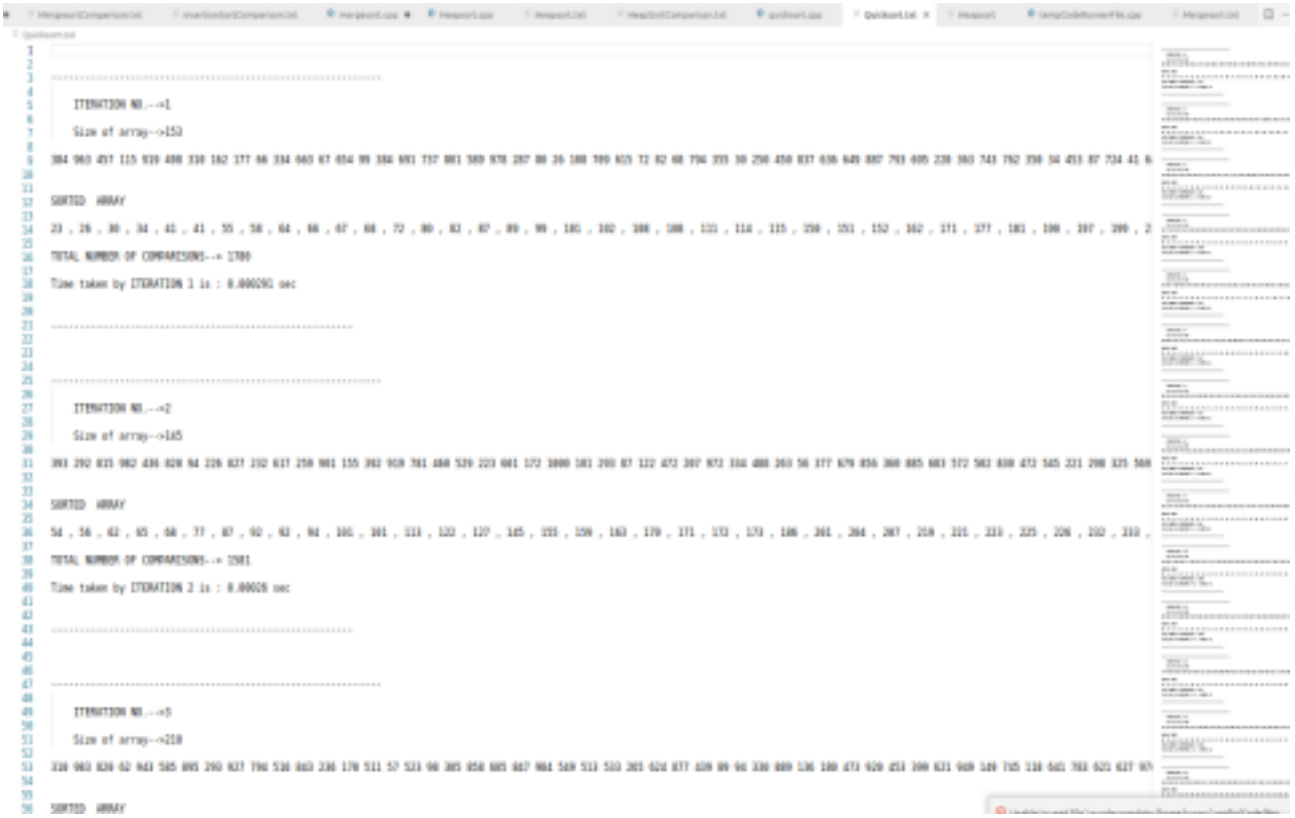
# QUICKSORT :

```
#include<bits/stdc++.h>
using namespace std;
const int N=1e5+1;
int arr[N];
int Noc=0;
int partition(int arr[], int low, int high)
{
int pivot = arr[low];
int i = low - 1, j = high + 1;

while (true) {
do {
i++;
Noc++;
} while (arr[i] < pivot);
do {
j--;
Noc++;

} while (arr[j] > pivot);
if (i >= j)
return j;

swap(arr[i], arr[j]);
}
}
int randomPivot(int arr[], int low, int high)
{
int random = low + rand() % (high - low);

swap(arr[random], arr[low]);

return partition(arr, low, high);
}
void quickSort(int arr[], int low, int high)
{
if (low < high) {
int pi = randomPivot(arr, low, high);
quickSort(arr, low, pi);
quickSort(arr, pi + 1, high);
}
}
int main()
{
int t=100;
```

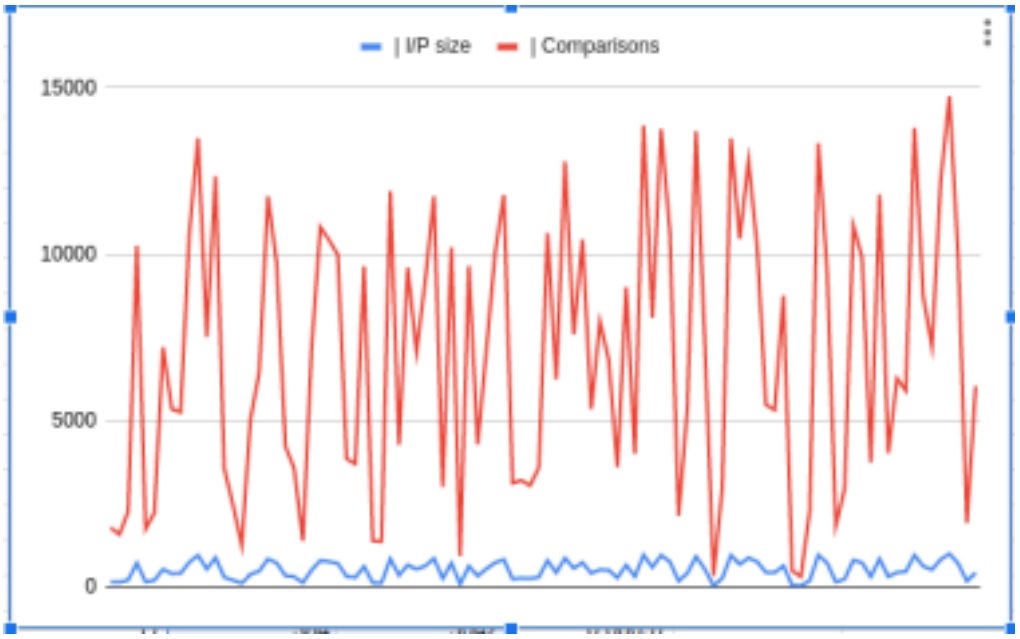
```
srand(time(0));
ofstream outdata;
ofstream outdata2;
outdata.open("Quicksort.txt");
outdata2.open("QuicksortComp.txt");
outdata2<<"ITERATION NO. |"<<"\t| I/P size\t"<<"\t| Comparisons\t"<<"\t| Time
(sec)"<<endl<<endl;
while(t--)
{
clock_t start, end;
cout<<endl;
outdata<<endl;
outdata<<"\n-----------------------------------------------------\n\n";
cout<<"\tITERATION NO.-->"<<100-t<<"\n";
outdata<<"\tITERATION NO.-->"<<100-t<<"\n";

start = clock();
int lb = 20, ub = 1000;
int l=30,u=1000;
int n=(rand() % (u - l + 1)) + l ;
cout<<endl;
cout<<"\tSize of array-->"<<n<<"\n\n";
outdata<<endl;
outdata<<"\tSize of array-->"<<n<<"\n\n";

for(int i=0;i<n;i++)
{
int x=(rand() % (ub - lb + 1)) + lb;
cout<<x<<" ";
outdata<<x<<" ";
arr[i]=x;
}
cout<<endl;
outdata<<endl;

quickSort(arr, 0, n - 1);
cout<<"\n\tSorted array\n\n";
outdata<<"\n\nSORTED ARRAY\n\n";

for (int i = 0; i < n; i++)
{
cout<<arr[i]<<" , ";
outdata<<arr[i]<< " , ";
}
cout<<"\n\nTOTAL NUMBER OF COMPARISONS--> "<<Noc<<"\n\n";
outdata<<"\n\nTOTAL NUMBER OF COMPARISONS--> "<<Noc<<"\n\n"; end =
clock();
```

```
double time_taken = double(end - start) / double(CLOCKS_PER_SEC);


cout << "Time taken by ITERATION "<<100-t<<" is : " << fixed
<< time_taken << setprecision(5);
cout << " sec " << endl<<endl;

outdata << "Time taken by ITERATION "<<100-t<<" is : " << fixed
<< time_taken << setprecision(5);
outdata << " sec " << endl<<endl;

outdata2<<"\t"<<100-t<<"\t"<<n<<"\t"<<Noc<<"\t"<< fixed<<time_taken <<
setprecision(5)<<"\n";
Noc=0;
cout<<"\n-------------------------------------------------\n\n";
outdata<<"\n-------------------------------------------------\n\n";
}
}
```

# OUTPUT :



# GRAPH :


| I/P size
| Comparisons
15000
10000
5000
0