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SUBJECT	Design and analysis of algorithm
EXPERIMENT NO :	1B
AIM:	Experiment on finding the running time of an insertion sort and selection sort.
ALGORITHM	**Main function:** step 1: start Step2: call generate_numbers() function Step 2: call operation()function Step 3: end generate_numbers() function: step 1: start step 2: crate the file pointer step 3: open the file in writing mode step 3: starts the loop from 0 to 100000 step 4: insert the 100000 random numbers in the file step 5: close the file handle step 6: end operation function(): step 1: start step 2: open the file in reading mode step 3: start the loop from 0 to 100000 and increment it with 100 step 4: create two arrays step 5: start the loop from 0 to j and scan the data from file

```
step 6: before sorting store the time
step 7: perform selection sort
step 8: check the time after the sorting
step 9: calculate the time taken by the algorithm
step 10: before sorting store the time
step 11: perform selection sort
step 12: check the time after the sorting
step 13: calculate the time taken by the algorithm
```

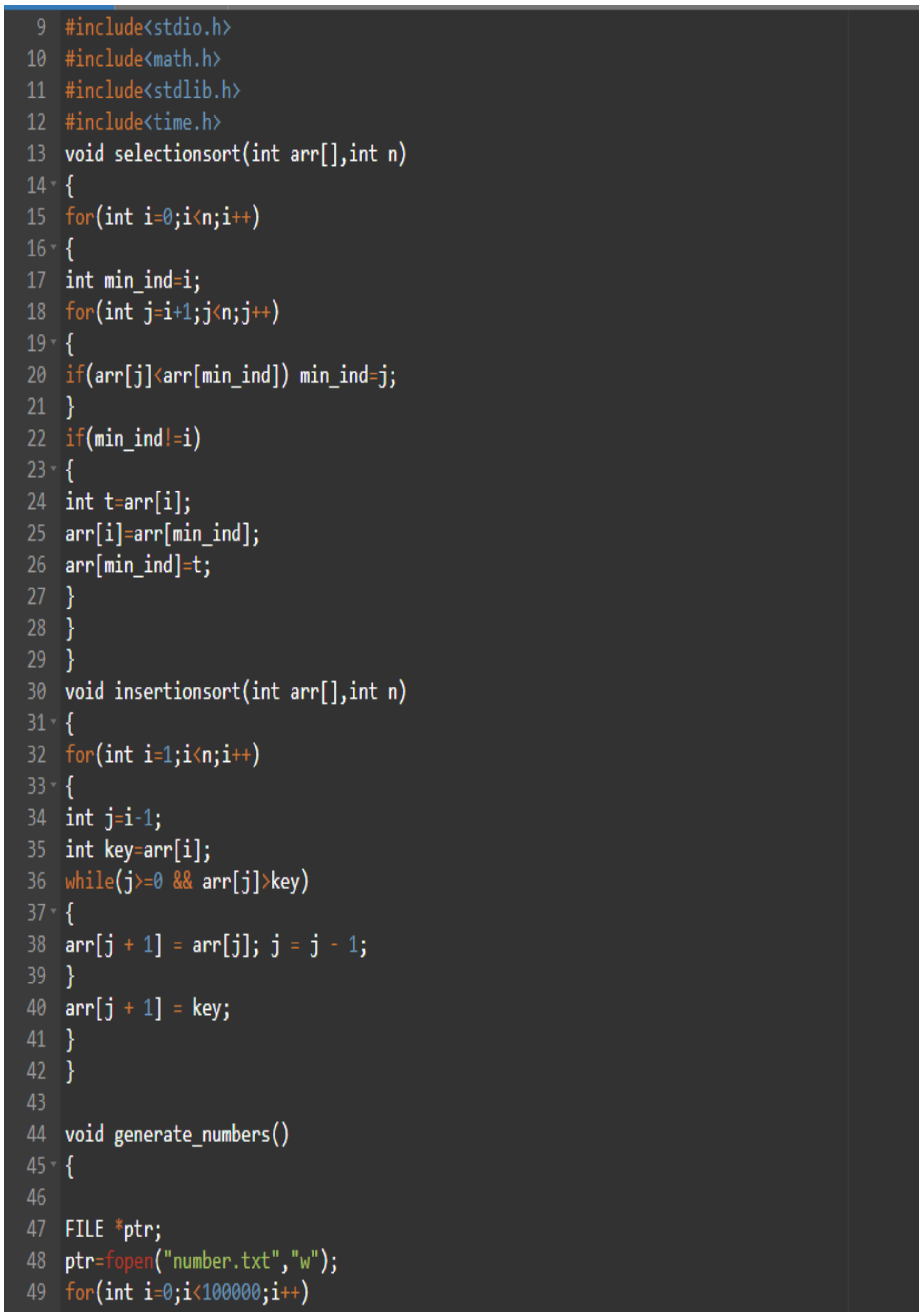
Selection sort:

```
step 1: start
step 2: start the loop
step 3: initialize the min element
step 4: start the loop from i+1 to n
step 5: check the condition:
if jth element less than min element then minimum
element will be j.
step 6: if minimum element not equal to i,
then initialize variable t with array(i)
perform ith element = array of min
array(min) = t
step 7: end.
```

Insertion sort:

```
Step 1: start
Step 2: start the loop from 1 to n
Step 3: initialize j with i-1
Step 4: current element is array(i)
Step 5: if array(key)>0 and j>=0
        Repeat below steps 6,7
Step 6: j+1th element will jth element
Step 7: decrement j
Step 8: array(j+1) = current.
Step 9: end.
```

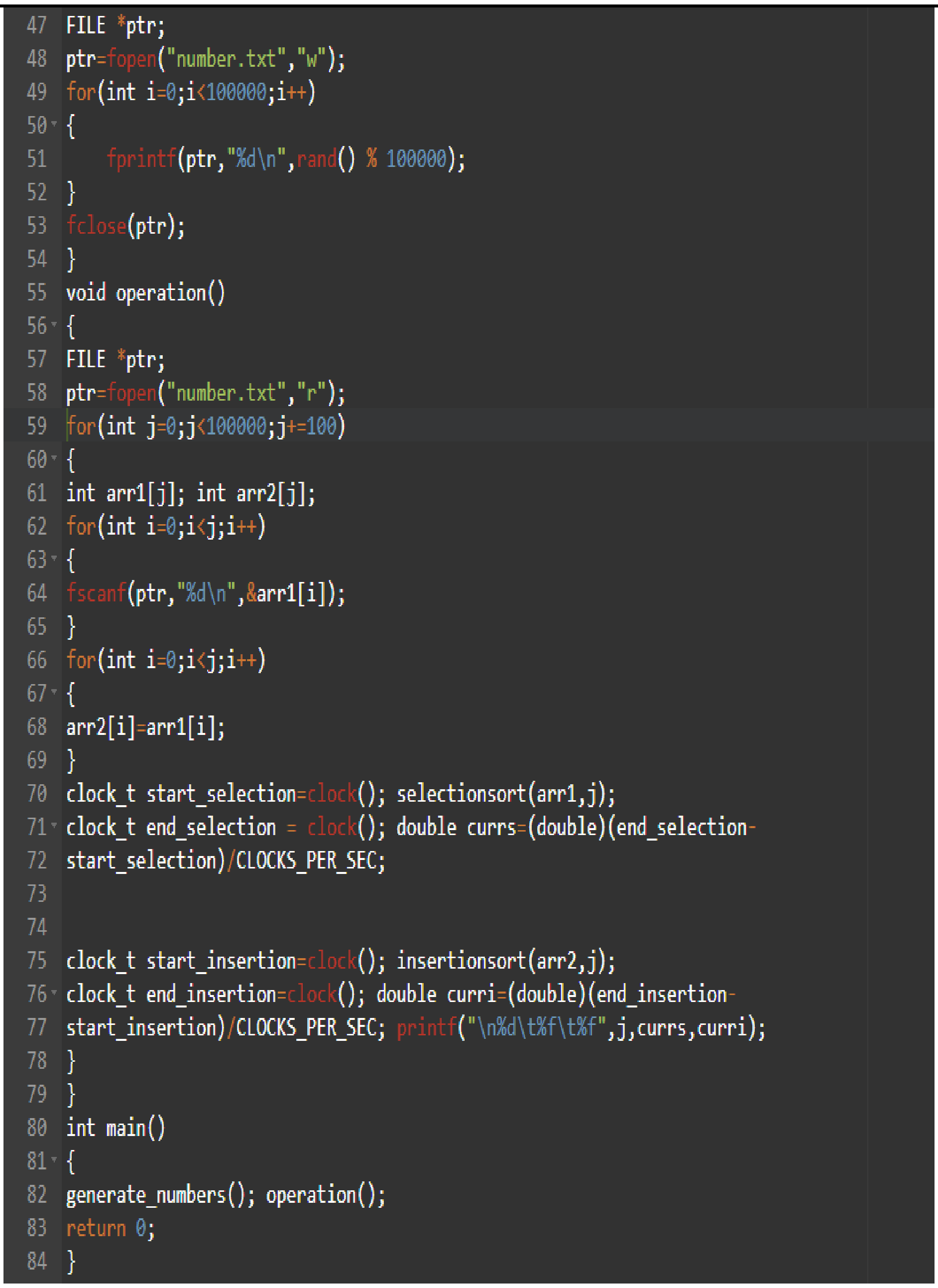
PROGRAM:



```
#include<stdio.h>
#include<math.h>
#include<stdlib.h>
#include<time.h>
void selectionsort(int arr[],int n)
{
for(int i=0;i<n;i++)
{
int min_ind=i;
for(int j=i+1;j<n;j++)
{
if(arr[j]<arr[min_ind]) min_ind=j;
}
if(min_ind!=i)
{
int t=arr[i];
arr[i]=arr[min_ind];
arr[min_ind]=t;
}
}
}
void insertionsort(int arr[],int n)
{
for(int i=1;i<n;i++)
{
int j=i-1;
int key=arr[i];
while(j>=0 && arr[j]>key)
{
arr[j + 1] = arr[j]; j = j - 1;
}
arr[j + 1] = key;
}
}

void generate_numbers()
{

FILE *ptr;
ptr=fopen("number.txt","w");
for(int i=0;i<100000;i++)
```

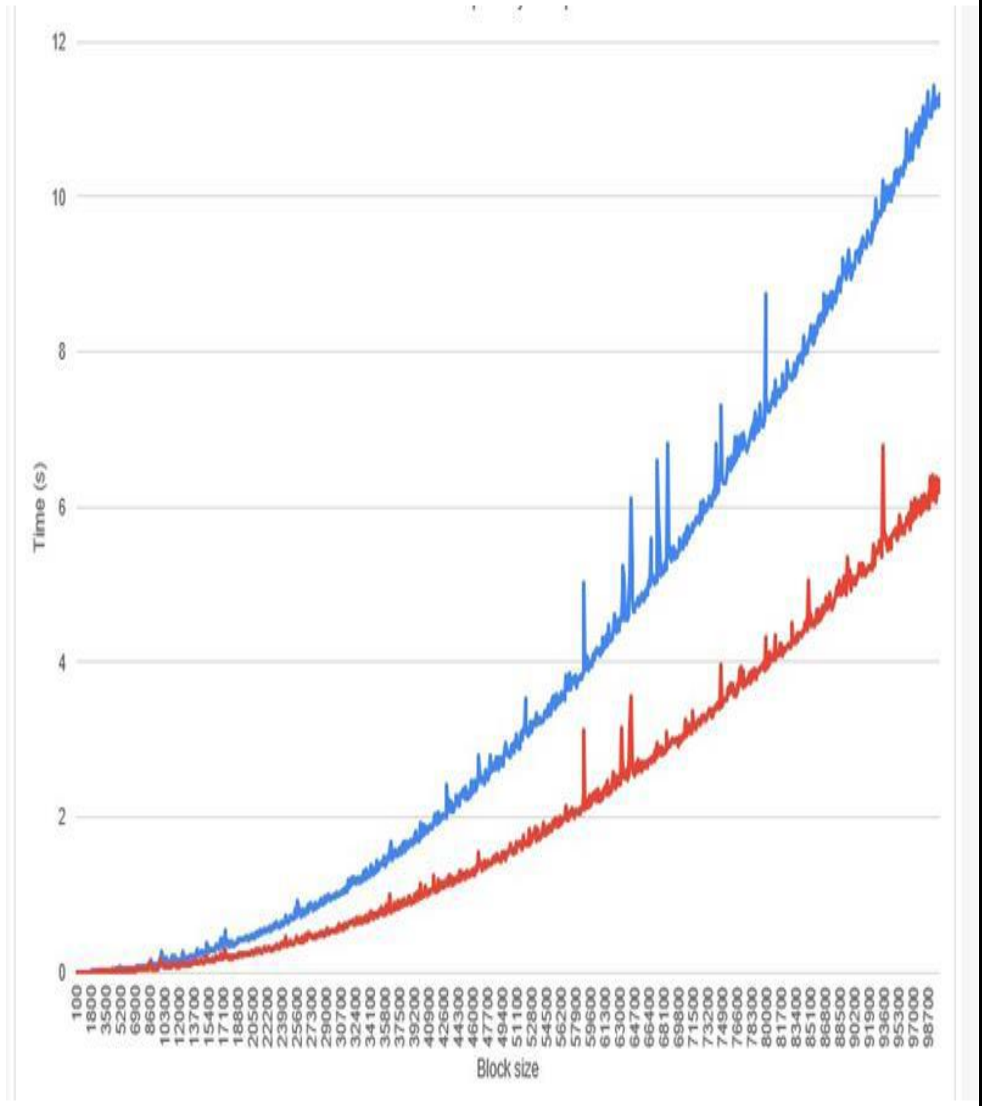


```c
FILE *ptr;
ptr=fopen("number.txt","w");
for(int i=0;i<100000;i++)
{
    fprintf(ptr,"%d\n",rand() % 100000);
}
fclose(ptr);
}
void operation()
{
FILE *ptr;
ptr=fopen("number.txt","r");
for(int j=0;j<100000;j+=100)
{
int arr1[j]; int arr2[j];
for(int i=0;i<j;i++)
{
fscanf(ptr,"%d\n",&arr1[i]);
}
for(int i=0;i<j;i++)
{
arr2[i]=arr1[i];
}
clock_t start_selection=clock(); selectionsort(arr1,j);
clock_t end_selection = clock(); double currs=(double)(end_selection-
start_selection)/CLOCKS_PER_SEC;


clock_t start_insertion=clock(); insertionsort(arr2,j);
clock_t end_insertion=clock(); double curri=(double)(end_insertion-
start_insertion)/CLOCKS_PER_SEC; printf("\n%d\t%f\t%f",j,currs,curri);
}
}
int main()
{
generate_numbers(); operation();
return 0;
}
```

OBSERVATION:

Graph of Selection sort and Insertion sort:



CONCLUSION:	Successfully performed the experiment of Selection sort and insertion sort and found the running time for each sorting algorithm in C Language. Concluded that insertion sort is efficient than selection sort.