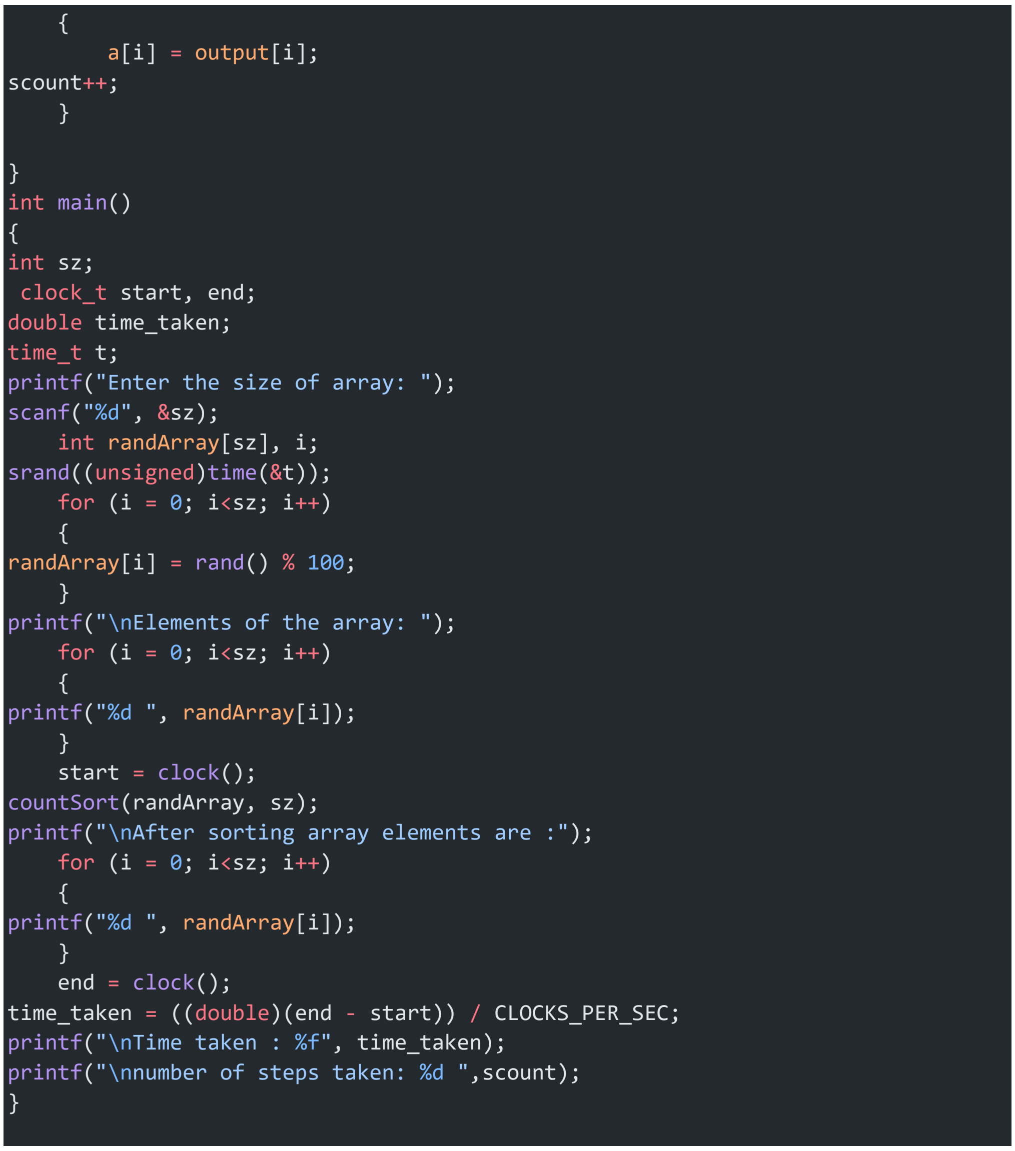
Practical-5

- Implement of counting sort

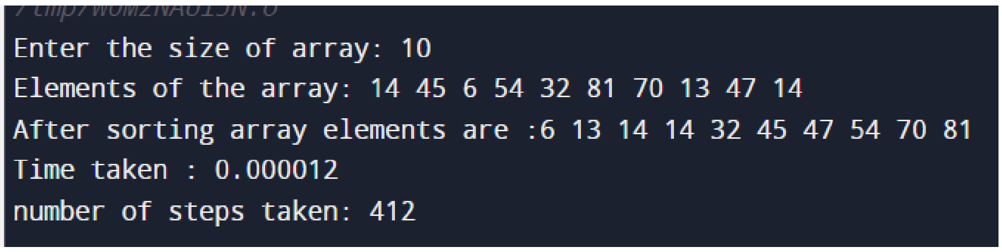
Code:

```
#include <stdio.h>
#include <stdlib.h>
#include <time.h>
int scount = 0;
int getMax(int a[], int n)
{
    int max = a[0];
scount++;
    for (int i = 1; i< n; i++, scount++)
    {
        if (a[i] > max)
        {
            max = a[i];
scount++;
        }

    }
    return max;
scount++;
}
void countSort(int a[], int n)
{
    int output[n + 1];
scount++;
    int max = getMax(a, n);
scount++;
    int count[max + 1];

scount++;
    for (int i = 0; i<= max; ++i,scount++)
    {
        count[i] = 0;
scount++;
    }
    for (int i = 0; i< n; i++,scount++)
    {
        count[a[i]]++;
scount++;
    }
    for (int i = 1; i<= max; i++,scount++)
    {
        count[i] += count[i - 1];
scount++;
    }
    for (int i = n - 1; i>= 0; i--,scount++)
    {
        output[count[a[i]] - 1] = a[i];
scount++;
        count[a[i]]--;
scount++;
    }
    for (int i = 0; i< n; i++,scount++)
```



```
    {
        a[i] = output[i];
scount++;
    }

}
int main()
{
int sz;
 clock_t start, end;
double time_taken;
time_t t;
printf("Enter the size of array: ");
scanf("%d", &sz);
    int randArray[sz], i;
srand((unsigned)time(&t));
    for (i = 0; i<sz; i++)
    {
randArray[i] = rand() % 100;
    }
printf("\nElements of the array: ");
    for (i = 0; i<sz; i++)
    {
printf("%d ", randArray[i]);
    }
    start = clock();
countSort(randArray, sz);
printf("\nAfter sorting array elements are :");
    for (i = 0; i<sz; i++)
    {
printf("%d ", randArray[i]);
    }
    end = clock();
time_taken = ((double)(end - start)) / CLOCKS_PER_SEC;
printf("\nTime taken : %f", time_taken);
printf("\nnumber of steps taken: %d ",scount);
}
```

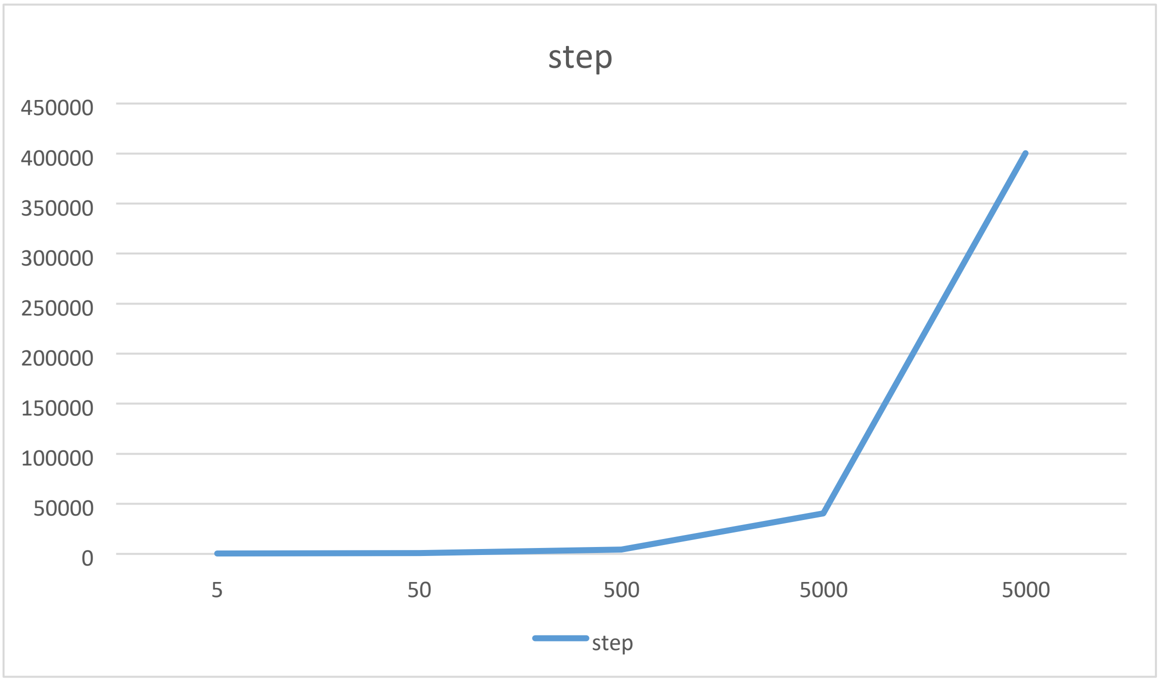
Output:

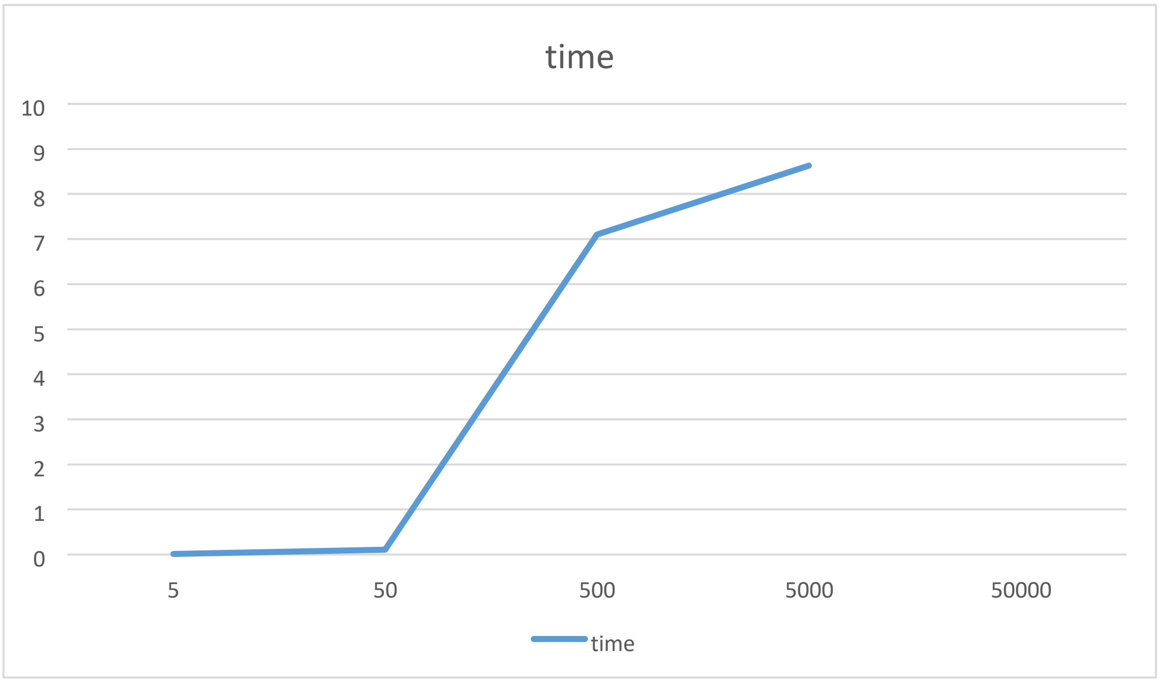


```
Enter the size of array: 10
Elements of the array: 14 45 6 54 32 81 70 13 47 14
After sorting array elements are :6 13 14 14 32 45 47 54 70 81
Time taken : 0.000012
number of steps taken: 412
```

Values	Steps	Time Taken
5	386	0.012
50	792	0.11
500	4404	7.1
5000	40404	8.63

50000	**400401**	**64.94**


step
step


time
time