

DESIGN ANALYSIS AND ALGORITHM

PRACTICAL NO 1

027_Abhishek_Ojha

Experiment No -1**Date of Experiment : 27 August 2021**

Program : - Write a program to implement Insertion sort and find the running time of the algorithm

Example :-

Input :- A[4, 6, 8, 1, 3, 32, 12]

Algorithm :-

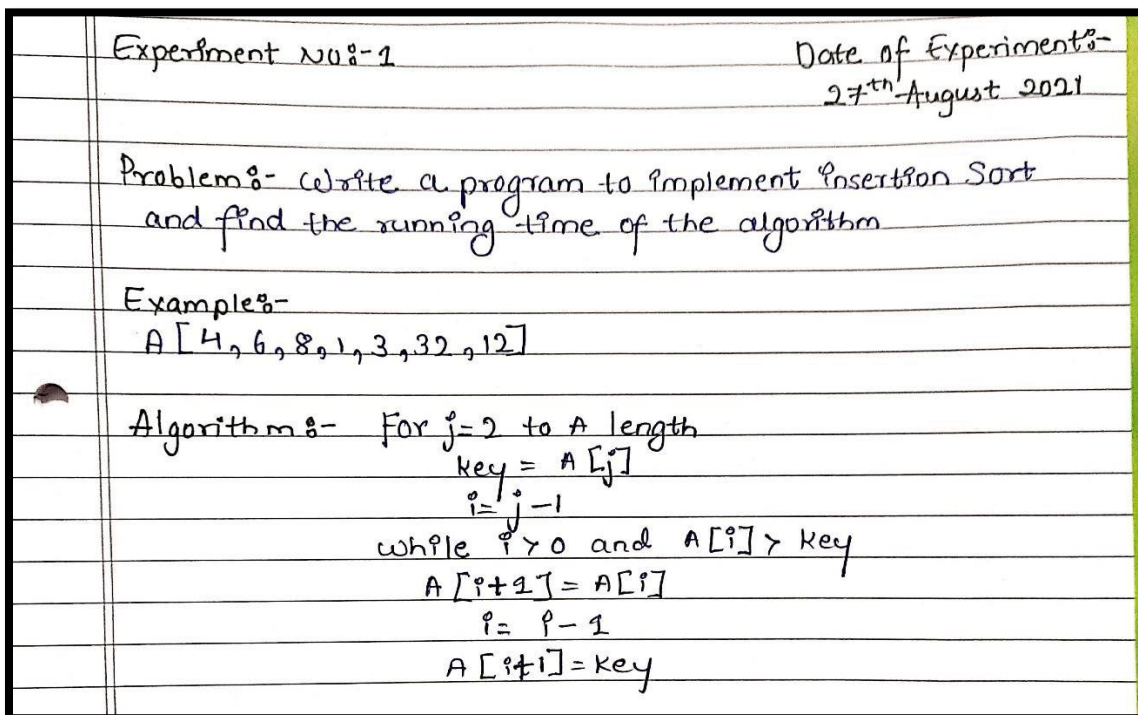
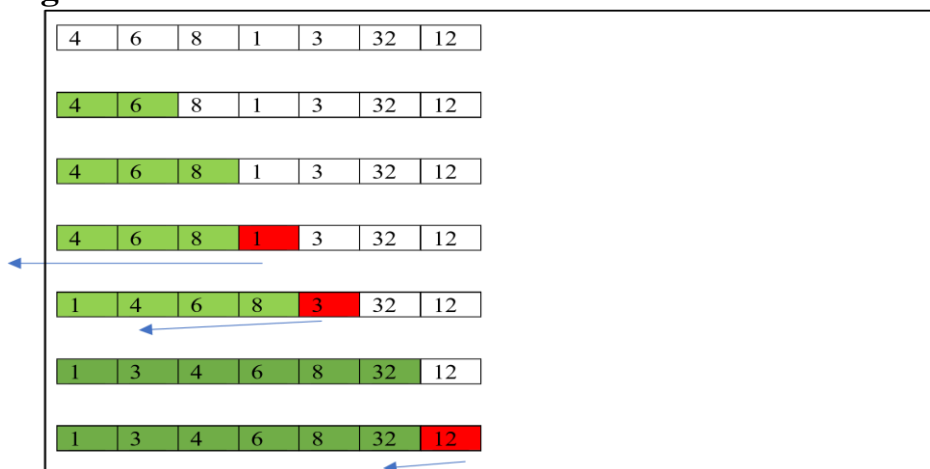


Fig :



Program:

program :-

```

import java.io.*;
public class InsertionSort
{
    public static void Sort (int a[])
    {
        int n = a.length, i, j, p, temp;
        for (i = 1; i < n; i++)
        {
            for (j = i - 1; j >= 0 && a[j + 1] < a[j]; j--)
            {
                temp = a[j + 1];
                a[j + 1] = a[j];
                a[j] = temp;
            }
        }
    }

    public static void printarray (int a[])
    {
        for (int i = 0; i < a.length; i++)
        {
            System.out.print (a[i] + " ");
        }
    }

    public static void main (String [] args) throws
        IOException
    {
        int n, i;
    }

```

```
BufferedReader b = new BufferedReader (new InputStream
Reader (System.in));
```

```
System.out.println (" Enter Number : ");
```

```
n = Integer.parseInt(b.readLine());
```

```
int a[] = new int [n];
```

```
System.out.println (" enter 'n' elements ");
```

```
for (i = 0; i < n; i++)
```

```
    a[i] = Integer.parseInt(b.readLine());
```

```
System.out.println (" Elements in array ");
```

```
printarray(a);
```

```
Sort(a);
```

```
System.out.println (" \n Elements after Sorting ");
```

```
printarray(a);
```


```
}
```

```
}
```

Conclusion:- Running time of Insertion sort
 $O(n^2)$

Practical Implementation of Insertion Sort :-


 InserionSort.java X

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```

1  import java.io.*;
2  public class InsertionSort
3  {
4
5      public static void Sort(int a[])
6      {
7          int n=a.length,i,j,p,temp;
8          for (i = 1;i < n; i++)
9          {
10
11              for (j=i-1; j >=0 && a[j+1]<a[j]; j--)
12              {
13                  temp=a[j+1];
14                  a[j+1]=a[j];
15                  a[j]=temp;
16              }
17          }
18      }
19
20      public static void printarray(int a[])
21      {
22          for(int i=0; i < a.length; i++)
23          {
24
25              System.out.print(a[i]+" ");
26          }
27      }
28
29      public static void main(String[] args) throws IOException
30      {
31
32          int n,i;
33          BufferedReader b=new BufferedReader(new InputStreamReader(System.in));

```

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```

36      System.out.println("enter Number: ");
37      n=Integer.parseInt(b.readLine());
38      int a[] = new int[n];
39      System.out.println("enter "+n+" elements ");
40      for(i= 0; i< n; i++)
41      {
42
43          a[i] = Integer.parseInt(b.readLine());
44      }
45      System.out.println("elements in array ");
46      printarray(a);
47      Sort(a);
48      System.out.println("\nelements after sorting");
49      printarray(a);
50
51  }
52  }
53

```

Output:

```
PS C:\Users\ayus\Desktop\DAA Practicals\027_Abhishek_Ojha\Experiment #01> javac InsertionSort.java
PS C:\Users\ayus\Desktop\DAA Practicals\027_Abhishek_Ojha\Experiment #01> java InsertionSort
enter Number:
7
enter 7 elements
4
6
8
1
3
32
12
elements in array
4 6 8 1 3 32 12
elements after sorting
1 3 4 6 8 12 32
PS C:\Users\ayus\Desktop\DAA Practicals\027_Abhishek_Ojha\Experiment #01> 
```

Conclusion: Running time of Insertion Sort $\theta(n^2)$