

Roll No. : 124

Name : Singh Chandani Harendra

Q1. : Create a class for integer array. Define the methods to sort the array for each following sorting algorithms.

- 1. Insertion sort**
- 2. Selection sort**
- 3. Bubble sort**
- 4. Quick sort**
- 5. Merge sort**

```
package ds2021;

import java.util.Scanner;

public class IntArray {
    int a[] = new int[100];
    int size;
    IntArray(int n){
        this.size = n;
    }
    Scanner scn = new Scanner(System.in);
    void Input(){
        System.out.println("Enter "+ this.size + " elements of Array : ");
        for(int i=0;i<this.size;i++){
            this.a[i] = scn.nextInt();
        }
    }
    void Output(){
        System.out.println("Elements of Array : ");
        for(int i=0;i<this.size;i++){
            System.out.print(this.a[i]+" ");
        }
    }
    void Insertion_Sort(){
        for(int i=0;i<this.size;i++){
            int key = this.a[i];
            int j = i-1;
            for(;;j >= 0) && (this.a[j] > key);j--){
                this.a[j+1] = this.a[j];
            }
        }
    }
}
```

Roll No. : 124

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```
        this.a[j+1] = key;
    }
}

void Selection_Sort(){
    for(int i=0;i<this.size-1;i++){
        int min = i;
        int j = i+1;
        for(;j<this.size;j++){
            if(this.a[j] < this.a[min]){
                min = j;
            }
        }
        int temp = this.a[min];
        this.a[min] = this.a[i];
        this.a[i] = temp;
    }
}

void Bubble_Sort(){
    for(int i=0;i<this.size;i++){
        for(int j=0;j<this.size-i-1;j++){
            if(this.a[j] > this.a[j+1]){
                int temp = this.a[j];
                this.a[j] = this.a[j+1];
                this.a[j+1] = temp;
            }
        }
    }
}
```

Roll No. : 124

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```
void Quick_Sort(int lb,int ub){
    boolean flag = true;
    if(lb < ub){
        int left = lb;
        int right = ub+1;
        int pivot = this.a[lb];
        while(flag){
            left++;
            while(this.a[left] < pivot){
                left++;
                if(left > ub){
                    break;
                }
            }
            right--;
            while(this.a[right] > pivot){
                right--;
                if(right < lb){
                    break;
                }
            }
            if(left < right){
                int temp = this.a[left];
                this.a[left] = this.a[right];
                this.a[right] = temp;
            }
            else{
                flag = false;
            }
        }
    }
}
```

Roll No. : 124

Name : Singh Chandani Harendra

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-

```
        }
    }
    int temp = this.a[right];
    this.a[right] = this.a[lb];
    this.a[lb] = temp;
    this.Output();
    if(lb <= right-1){
        this.Quick_Sort(lb, right-1);
    }
    if(right+1 <= ub){
        this.Quick_Sort(right+1, ub);
    }
}

void Merge_Sort(int lb,int ub){
    if(lb < ub){
        int mid = lb + ((ub - lb) / 2);
        this.Merge_Sort(lb,mid);
        this.Merge_Sort(mid+1, ub);
        this.Merge(lb, mid, ub);
    }
}

void Merge(int lb,int mid,int ub){
    int size1 = mid - lb +1;
    int size2 = ub - mid;

    int left[] = new int[size1];
    int right[] = new int[size2];
```

Roll No. : 124

Name : Singh Chandani Harendra

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-

```
for(int i=0;i < size1; i++){
    left[i] = this.a[lb + i];
}
for(int j =0; j < size2 ; j++){
    right[j] = this.a[mid + 1 + j];
}

int index1 = 0,index2 =0;
int k = lb;

while(index1 < size1 && index2 < size2){
    if(left[index1] <= right[index2]){
        this.a[k] = left[index1];
        index1++;
    }
    else{
        this.a[k] = right[index2];
        index2++;
    }
    k++;
}

while(index1 < size1){
    this.a[k] = left[index1];
    index1++;
    k++;
}
```

Roll No. : 124

Name : Singh Chandani Harendra

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```
while(index2 < size2){
    this.a[k] = right[index2];
    index2++;
    k++;
}
}

public static void main(String str[]){
    int n;
    Scanner sc = new Scanner(System.in);
    System.out.println("ENter size of Array : ");
    n = sc.nextInt();
    IntArray arr = new IntArray(n);
    arr.Input();
    char c,ch;
    String s;
    while(true){
        System.out.println("\nOptions");
        System.out.println("=====");
        System.out.println("1 - Insertion Sort");
        System.out.println("2 - Selection Sort");
        System.out.println("3 - Bubble Sort");
        System.out.println("4 - Quick Sort");
        System.out.println("5 - Merge Sort");
        System.out.println("6/<p> - Display");
        System.out.println("0/<q> - Exit");
        System.out.println("Enter Your Choice : ");
        s = sc.next();
```

Roll No. : 124

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-

```
c = s.charAt(0);
switch(c){
    case '1':
        System.out.println("\nBefore Insertion Sort : ");
        arr.Output();
        arr.Insertion_Sort();
        System.out.println("\nAfter Insertion Sort : ");
        arr.Output();
        break;
    case '2':
        System.out.println("\nBefore Selection Sort : ");
        arr.Output();
        arr.Selection_Sort();
        System.out.println("\nAfter Selection Sort : ");
        arr.Output();
        break;
    case '3':
        System.out.println("\nBefore Bubble Sort : ");
        arr.Output();
        arr.Bubble_Sort();
        System.out.println("\nAfter Bubble Sort : ");
        arr.Output();
        break;
    case '4':
        System.out.println("\nBefore Quick Sort : ");
        arr.Output();
        arr.Quick_Sort(0,arr.size-1);
        System.out.println("\nAfter Quick Sort : ");
```

Roll No. : 124

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- 1. Insertion sort**
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- 4. Quick sort**
- 5. Merge sort**

```
        arr.Output();
        break;
    case '5':
        System.out.println("\nBefore Merge Sort : ");
        arr.Output();
        arr.Merge_Sort(0,arr.size-1);
        System.out.println("\nAfter Merge Sort : ");
        arr.Output();
        break;
    case 'p':
    case '6':
        arr.Output();
        break;
    case 'q':
    case '0':
        System.exit(0);
        break;
    default:
        System.out.println("Please enter valid choice....");
        break;
    }
}
}
```


Roll No. : 124

Name : Singh Chandani Harendra

Q2. : Create a class for String array (name of students). Define the methods to sort the array for sorting algorithms listed in q1.

```
package ds2021;

import java.util.Scanner;

public class StrArray {

    String a[] = new String[100];

    int size;

    StrArray(int n){

        this.size = n;

    }

    Scanner scn = new Scanner(System.in);

    void Input(){

        System.out.println("Enter "+this.size+" Student's name : ");

        for(int i=0;i<this.size;i++){

            this.a[i] = scn.next();

        }

    }

    void Output(){

        System.out.println("Student's name : ");

        for(int i=0;i<this.size;i++){

            System.out.print(a[i]+" ");

        }

    }

    void Insertion_Sort(){

        for(int i=0;i<this.size;i++){

            String key = this.a[i];

            int j=i-1;

            for(;;j >= 0) && ((this.a[j].compareToIgnoreCase(key)) > 0);j--){

                this.a[j+1] = this.a[j];

            }

            this.a[j+1] = key;

        }

    }

}
```

Roll No. : 124

Name : Singh Chandani Harendra

Q2. : Create a class for String array (name of students). Define the methods to sort the array for sorting algorithms listed in q1.

```
void Selection_Sort(){
    for(int i=0;i<this.size-1;i++){
        int min = i;
        int j=i+1;
        for(;j<this.size;j++){
            if( (this.a[j].compareToIgnoreCase(this.a[min])) < 0){
                min = j;
            }
        }
        String temp = this.a[i];
        this.a[i] = this.a[min];
        this.a[min] = temp;
    }
}

void Bubble_Sort(){
    for(int i=0;i<this.size;i++){
        for(int j=0;j<this.size-i-1;j++){
            if(this.a[j].compareToIgnoreCase(this.a[j+1]) > 0){
                String temp = this.a[j];
                this.a[j] = this.a[j+1];
                this.a[j+1] = temp;
            }
        }
    }
}

void Quick_Sort(int lb,int ub){
    boolean flag = true;
    if(lb < ub){
        int left = lb;
        int right = ub+1;
        String pivot = this.a[lb];
```

Roll No. : 124

Name : Singh Chandani Harendra

Q2. : Create a class for String array (name of students). Define the methods to sort the array for sorting algorithms listed in q1.

```
while(flag){
    left++;
    while((this.a[left].compareToIgnoreCase(pivot)) < 0){
        left++;
        if(left > ub){
            break;
        }
    }
    right--;
    while((this.a[right].compareToIgnoreCase(pivot)) > 0){
        right--;
        if(right < lb){
            break;
        }
    }
    if(left < right){
        String temp = this.a[left];
        this.a[left] = this.a[right];
        this.a[right] = temp;
    }
    else{
        flag = false;
    }
}

String temp = this.a[right];
this.a[right] = this.a[lb];
this.a[lb] = temp;
this.Output();
if(lb <= right-1){
    this.Quick_Sort(lb, right-1);
}
```

Roll No. : 124

Name : Singh Chandani Harendra

Q2. : Create a class for String array (name of students). Define the methods to sort the array for sorting algorithms listed in q1.

```
        if(right+1 <= ub){
            this.Quick_Sort(right+1, ub);
        }
    }
}

void Merge_Sort(int lb,int ub){
    if(lb < ub){
        int mid = lb + ((ub - lb) / 2);
        this.Merge_Sort(lb,mid);
        this.Merge_Sort(mid+1, ub);
        this.Merge(lb, mid, ub);
    }
}

void Merge(int lb,int mid, int ub){
    int size1 = mid - lb +1;
    int size2 = ub - mid;

    String left[] = new String[size1];
    String right[] = new String[size2];

    for(int i=0;i < size1; i++){
        left[i] = this.a[lb + i];
    }
    for(int j =0; j < size2 ; j++){
        right[j] = this.a[mid + 1 + j];
    }

    int index1 = 0,index2 =0;
    int k = lb;
    while(index1 < size1 && index2 < size2){
        if((left[index1].compareToIgnoreCase(right[index2])) <= 0){
```

Roll No. : 124

Name : Singh Chandani Harendra

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```
        this.a[k] = left[index1];
        index1++;
    }
    else{
        this.a[k] = right[index2];
        index2++;
    }
    k++;
}

while(index1 < size1){
    this.a[k] = left[index1];
    index1++;
    k++;
}

while(index2 < size2){
    this.a[k] = right[index2];
    index2++;
    k++;
}
}

public static void main(String str[]){
    int n;
    Scanner sc = new Scanner(System.in);
    System.out.println("ENter size of Array : ");
    n = sc.nextInt();
    StrArray arr = new StrArray(n);
    arr.Input();
    String s;
    char c;
    while(true){
        System.out.println("\nOptions");
```

Roll No. : 124

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Q2. : Create a class for String array (name of students). Define the methods to sort the array for sorting algorithms listed in q1.

```
System.out.println("1. Insertion Sort");
System.out.println("2. Selection Sort");
System.out.println("3. Bubble Sort");
System.out.println("4. Quick Sort");
System.out.println("5. Merge Sort");
System.out.println("6.<d>. Display");
System.out.println("0/<q>. Exit");
System.out.println("Enter Your Choice : ");
s = sc.next();
c = s.charAt(0);
switch(c){
    case '1':
        System.out.println("Before Insertion Sort : ");
        arr.Output();
        arr.Insertion_Sort();
        System.out.println("After Insertion Sort : ");
        arr.Output();
        break;
    case '2':
        System.out.println("Before Selection Sort : ");
        arr.Output();
        arr.Selection_Sort();
        System.out.println("After Selection Sort : ");
        arr.Output();
        break;
    case '3':
        System.out.println("Before Bubble Sort : ");
        arr.Output();
        arr.Bubble_Sort();
        System.out.println("After Bubble Sort : ");
        arr.Output();
```

Roll No. : 124

Name : Singh Chandani Harendra

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```
        break;
    case '4':
        System.out.println("Before Quick Sort : ");
        arr.Output();
        arr.Quick_Sort(0,arr.size-1);
        System.out.println("After Quick Sort : ");
        arr.Output();
        break;
    case '5':
        System.out.println("Before Merge Sort : ");
        arr.Output();
        arr.Merge_Sort(0,arr.size-1);
        System.out.println("After Merge Sort : ");
        arr.Output();
        break;
    case '6':
    case 'd':
        arr.Output();
        break;
    case '0':
    case 'q':
        System.exit(0);
        break;
    default:
        System.out.println("Please enter valid choice....");
        break;
    }
}
}
```