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TP-2

1-Trouvez l'exécution du programme suivant

```
package jexem15;
public class Jexem15 {
    static void affiche(int t[])
    {
        for(int i=0;i<t.length;i++)
            System.out.print(t[i]+" ");
        System.out.println();
    }

    public static void main(String[] args) {

        int[] t1={5,2,4,5};
        affiche(t1); // 5 2 4 5
        int t2[];
        t2=t1;
        affiche(t2); // 5 2 4 5
        System.out.println(t1.equals(t2)); // True
        t2[2]=25;
        affiche(t1); // 5 2 25 5
        int t3[];
        t3=t1.clone();
        affiche(t3); // 5 2 25 5
        t3[2]=30;
        affiche(t1); // 5 2 25 5
        affiche(t3); // 5 2 30 5
        System.out.println(t1.equals(t3)); // False
    }
}
```

2- Trouvez l'exécution du programme suivant

```
package jexem15;
public class Jexem15 {
    static void affiche(int t[][] )
    {
        for(int i=0;i<t.length;i++){
            for(int j=0;j<t[i].length;j++)
                System.out.print(t[i][j]+" ");
            System.out.println();
        }
    }

    public static void main(String[] args) {

        int[][] t1={{5,2,4, 5},{2,3,4}};
```

```

        affiche(t1); // 5 2 4 5 2 3 4
        int[][] t2;
        t2=t1;
        affiche(t2); // 5 2 4 5 2 3 4
        t2[1][1]=25;
        affiche(t1); // 5 2 4 5 2 25 4
        System.out.println(t1.equals(t2)); // True
        int[][] t3;
        t3=t1.clone();
        affiche(t3); // 5 2 4 5 2 25 4
        t3[1][1]=30;
        affiche(t1); // 5 2 4 5 2 25 4
        System.out.println(t1.equals(t3)) ; // False
    }
}

```

3-Ecrire un programme permettant d'entrer un entier positif n et garde les diviseurs de n dans un tableau t .

```

import java.util.*;

public class Main
{
    static List<Integer> divisors(int n) {
        List <Integer> divs = new ArrayList <Integer>();
        for (int i=2; i < n; i++)
            if (n % i == 0) divs.add(i);
        return divs;
    }

    public static void main (String[]args) {
        System.out.print("Give n : ");
        Scanner s = new Scanner(System.in);
        int n = s.nextInt();

        List <Integer> divs = divisors(n);
        Iterator<Integer> it = divs.iterator();

        System.out.printf("Divisors of %d : [ " , n);
        while (it.hasNext()) System.out.print(it.next()+" ");
        System.out.print("]");
    }
}

```

4-Ecrire un programme une matrice de $n*m$ éléments et permettant de mettre les colonnes de ce matrice par ordre croissant selon les premier éléments des chaque colonnes.

```

import java.util.*;

class Matrix {
    int M[][] , n , m;
}

```

```

Matrix() {
    Scanner s = new Scanner(System.in);

    System.out.print("How many rows ? ");
    n = s.nextInt();
    System.out.print("How many columns ? ");
    m = s.nextInt();

    System.out.printf("Enter %d elements (row by row) : ", n*m);

    M = new int[n][m];

    for(int i=0;i<n;i++)
        for(int j=0;j<m;j++)
            M[i][j] = s.nextInt();

    s.close();
}

// Random Matrix for testing purpose
Matrix(int n , int m) {
    this.n = n;
    this.m = m;

    M = new int[n][m];
    Random random = new Random();
    for(int i=0;i<n;i++)
        for(int j=0;j<m;j++)
            M[i][j] = random.nextInt(40);
}

public void Print() {
    for(int i=0;i<n;i++) {
        for(int j=0;j<m;j++)
            System.out.printf("%d\t",M[i][j]);
        System.out.println();
    }
    System.out.println();
}

public void SortByColumns() {
    int k;
    for(int i = 0 ; i < m ; i++) {
        for(int j = 0 ; j < m ; j++) {
            k=0;
            int temp = M[k][i];
            if(i == j) continue;

            while(temp == M[k][j]) {

```

```

        k++;
        if(M[k][i] < M[k][j])
            swapCols(i , j);
    }

    if(temp < M[k][j])
        swapCols(i , j);
    }
}

private void swapCols(int col1 , int col2) {
    int temp;
    for(int i = 0 ; i < n ; i++) {
        temp = M[i][col1];
        M[i][col1] = M[i][col2];
        M[i][col2] = temp;
    }
}

public class Main
{
    public static void main (String[]args) {
        Matrix M = new Matrix(6,7);
        System.out.println("Before Sorting : ");
        M.Print();
        System.out.println("After Sorting : ");
        M.SortByColumns();
        M.Print();
    }
}

```

```

Before Sorting :
11      3      23      35      35      23      20
29      15      17      35      7       4       8
36      36      10      10      2       22      24
32      35      38      14      15      36      21
22      19      29      25      15      6       8
36      8       38      34      38      14      21

After Sorting :
3       11      20      23      23      35      35
15      29      8       4       17      7       35
36      36      24      22      10      2       10
35      32      21      36      38      15      14
19      22      8       6       29      15      25
8       36      21      14      38      38      34

```

5- Soit le programme suivant :

```
package jexem16;
import java.util.Scanner;
class X{ private int[] a;
        public int Index;
        int size;
        X(int n){
            Index=0;
            this.size = n;
            a=new int[n];
            Scanner Scan=new Scanner(System.in);

            for(int i=0;i<n;i++){
                System.out.print("a["+i+"]=");
                a[i]=Scan.nextInt();
            }
        }
        void add(){
            if(Index+1 == this.size) return;
            Index++;
        };
        void Reculer(){
            if(Index-1 < 0) return;
            --Index;
        }
        void voir(){
            System.out.println("Index="+Index);
            System.out.println("a["+Index+"]="+a[Index]);
        }
};

public class Jexem16 {
    public static void main(String[] args) {
        System.out.println("Enter x:");
        X x=new X(4);
        System.out.println("Enter y:");
        X y=new X(3);
        x.voir(); // Index=0
        x.add(); x.add(); y.add();
        x.voir(); // Index=2
        y.voir(); // Index=1
        x.Reculer();
        y.add(); y.voir(); // Index=2
        x.voir(); // Index=1
        y.voir(); // Index=2
    }
}
```

Questions :

- a-Avant l'exécution donner le résultat?
- b-Ajouter les informations nécessaires pour que Index ne dépasse pas les limites de tableau a?
- c-Qu' arrive-t-il au programme si Index est private?
Meme si elle est Public

6-Ecrire en POO le problème de trouver le maximum des éléments d'un tableau de n nombres entiers?

Tester votre programme?

7-Ecrire en POO le problème de trouver le maximum des éléments d'un tableau de n chaines des caractères?

Tester votre programme?

Parite 6-7 Dans une seul class

```
import java.util.function.Supplier;
import java.util.*;

class MinMaxArray<T extends Comparable<? super T>> {
    private int size;
    private T max;
    private T min;
    private ArrayList<T> arr;

    // for testing purpose make it random
    MinMaxArray(int size , Supplier<T> newValueSupplier) {
        if(size < 1) return;
        this.size = size;

        arr = new ArrayList();

        for(int i=0;i<size;i++)
            arr.add(newValueSupplier.get());

        max = arr.get(0);
        min = arr.get(0);

        for(int i = 1 ; i < size ; i++) {
            if(max.compareTo(arr.get(i)) <= -1) max = arr.get(i);
            if(min.compareTo(arr.get(i)) >= 1) min = arr.get(i);
        }
    }

    public void replaceAt(int pos , T val) {
        if(pos < 0 || pos >= size) return;
        arr.set(pos , val);
        if(max.compareTo(val) <= -1) max = val;
        if(min.compareTo(val) >= 1) min = val;
    }

    public T getMax() {
        return max;
    }

    public T getMin() {
        return min;
    }

    public void Print() {
        for(int i=0 ; i < this.size ; i++) System.out.print(arr.get(i)+" ");
        System.out.println();
    }
}

public class Main {
    public static String generateString() {
        String alphabet = "bcdefghijklmnopqrstuvwxyz";
```

```

        StringBuilder sb = new StringBuilder();
        Random random = new Random();
        int length = 7;

        for(int i = 0; i < length; i++) {
            int index = random.nextInt(alphabet.length());

            char randomChar = alphabet.charAt(index);

            sb.append(randomChar);
        }

        return sb.toString();
    }

    public static void main(String[] args) {
        Scanner s = new Scanner(System.in);
        System.out.print("size of array : ");
        int size = s.nextInt();
        Random r = new Random();

        MinMaxArray<Integer> intMinMaxArray = new MinMaxArray<>(size, () ->
r.nextInt(100));
        intMinMaxArray.Print();
        System.out.printf("min = %d\n",intMinMaxArray.getMin());
        System.out.printf("max = %d\n",intMinMaxArray.getMax());

        intMinMaxArray.replaceAt(5 , 130); // Max in array is < 100 because
Generator is between [0-100[
        intMinMaxArray.replaceAt(8 , -10); // Min in array is > 0 because
Generator is between [0-100[

        System.out.println("\nAfter Inserting new elements : ");
        intMinMaxArray.Print();
        System.out.printf("min = %d\n",intMinMaxArray.getMin());
        System.out.printf("max = %d\n",intMinMaxArray.getMax());

        MinMaxArray<String> stringMinMaxArray = new MinMaxArray<>(size, () ->
generateString());
        stringMinMaxArray.Print();
        System.out.println("min = "+stringMinMaxArray.getMin());
        System.out.println("max = "+stringMinMaxArray.getMax());

        stringMinMaxArray.replaceAt(5 , "zzzzzzz"); // should be max because all
generated strings are from [b-y]
        stringMinMaxArray.replaceAt(8 , "aaaaaaa"); // should be min because all
generated strings are from [b-y]

        System.out.println("\nAfter Inserting new elements : ");
        stringMinMaxArray.Print();
        System.out.println("min = " + stringMinMaxArray.getMin());
        System.out.println("max = " + stringMinMaxArray.getMax());
    }
}

```

```

size of array :
10
80 39 3 56 77 19 23 79 14 81
min = 3
max = 81

After Inserting new elements :
80 39 3 56 77 130 23 79 -10 81
min = -10
max = 130
bikshvn gstydni rposknq yeksojq njirxge epqmvfe fkphlbp qbvpnrv eiqlrot hbfdujo
min = bikshvn
max = yeksojq

After Inserting new elements :
bikshvn gstydni rposknq yeksojq njirxge zzzzzzz fkphlbp qbvpnrv aaaaaaa hbfdujo
min = aaaaaaa
max = zzzzzzz

```

8- Ecrire en POO le problème de l'équation du second degré?
 Tester votre programme ?

```

class QuadratiqueEquation {
    private double a , b , c;
    QuadratiqueEquation(double a , double b , double c) {
        this.a = a;
        this.b = b;
        this.c = c;
    }

    public void Solve() {
        double x1, x2 , d;

        d = b * b - 4 * a * c;

        if (d > 0) {
            x1 = (-b + Math.sqrt(d)) / (2 * a);
            x2 = (-b - Math.sqrt(d)) / (2 * a);

            System.out.printf("x1 = %.2f\nx2 = %.2f\n", x1, x2);
        }

        else if (d == 0) {
            x1 = x2 = -b / (2 * a);
            System.out.printf("x1 = x2 = %.2f\n", x1);
        }
    }
}

```



```

    }

    else {
        double r = -b / (2 * a);
        double i = Math.sqrt(-d) / (2 * a);
        System.out.printf("x1 = %.2f+%.2fi\nx2 = %.2f+%.2fi\n", r, i ,r
, i);
    }
    System.out.println();
}

public void Print() {
    System.out.printf("%.2fX^2+%.2fX+%.2f\n" , a , b , c);
}
}

public class Main {

    public static void main(String[] args) {
        QuadratiqueEquation eq;

        eq = new QuadratiqueEquation(1 , 2 , 1);
        eq.Print();
        eq.Solve();

        eq = new QuadratiqueEquation(5 , 5 , 1);
        eq.Print();
        eq.Solve();

        eq = new QuadratiqueEquation(4 , 2 , 1);
        eq.Print();
        eq.Solve();
    }
}

```

```

1.00X^2+2.00X+1.00
x1 = x2 = -1.00

5.00X^2+5.00X+1.00
x1 = -0.28
x2 = -0.72

4.00X^2+2.00X+1.00
x1 = -0.25+0.43i
x2 = -0.25+0.43i

```