

```

//List
import java.util.Scanner;

class Mylist
{
    int a[];

    Scanner input = new Scanner(System.in);

    Mylist()
    {
        a = new int[5];
    }

    Mylist(int n)
    {
        a = new int[n];
    }

    Mylist(Mylist l)
    {
        a = new int[l.a.length];

        for(int i = 0; i < l.a.length; i++)
        {
            this.a[i] = l.a[i];
        }
    }

    void read()
    {
        Scanner input = new Scanner(System.in);

        System.out.println("\nEnter the Element in the list : ");

        for(int i = 0; i < a.length; i++)
        {
            System.out.print("\nEnter element "+i+" : ");
            a[i] = input.nextInt();
        }
    }

    void display()
    {
        System.out.println("\nThe Element of the List are : ");

        for(int i = 0; i < a.length; i++)
        {
            System.out.print(a[i]+"\\t");
        }
    }

    Mylist add(Mylist l)
    {
        Mylist tmp;

        if(this.a.length >= l.a.length)
        {
            tmp = new Mylist(this.a.length);

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        for(int i = 0; i < l.a.length; i++)
            tmp.a[i] = this.a[i] + l.a[i];

        for(int i = l.a.length; i < this.a.length; i++)
            tmp.a[i] = this.a[i];
    }
    else
    {
        tmp = new Mylist(l.a.length);

        for(int i = 0; i < this.a.length; i++)
            tmp.a[i] = this.a[i] + l.a[i];

        for(int i = this.a.length; i < l.a.length; i++)
            tmp.a[i] = l.a[i];
    }

    return tmp;
}

Mylist sub(Mylist l)
{
    Mylist tmp;

    if(this.a.length >= l.a.length)
    {
        tmp = new Mylist(this.a.length);

        for(int i = 0; i < l.a.length; i++)
            tmp.a[i] = this.a[i] - l.a[i];

        for(int i = l.a.length; i < this.a.length; i++)
            tmp.a[i] = this.a[i];
    }
    else
    {
        tmp = new Mylist(l.a.length);

        for(int i = 0; i < this.a.length; i++)
            tmp.a[i] = this.a[i] - l.a[i];

        for(int i = this.a.length; i < l.a.length; i++)
            tmp.a[i] = l.a[i];
    }

    return tmp;
}

void search(int key)
{
    int count = 0;
    int pos[] = new int[a.length];

    System.out.println("\nSearching key element...");

    for(int i = 0; i < this.a.length; i++)
    {
        if(this.a[i] == key)
        {
            pos[count] = i;
            count++;
        }
    }
}

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    }
}

if(count == 0)
    System.out.println("\nElement not found");
else
{
    System.out.print("\nElement found at ");

    for(int i = 0; i < count; i++)
        System.out.print(+pos[i]+"\\t");

    System.out.print("Possition \\n");
}
}

void bubbleSort()
{
    int tmp;
    for(int i = 0; i < this.a.length-1; i++)
    {
        for(int j = 0; j < (this.a.length-i-1); j++)
        {
            if(this.a[j] > this.a[j+1])
            {
                tmp = this.a[j];
                this.a[j] = this.a[j+1];
                this.a[j+1] = tmp;
            }
        }
    }
    //return this;
}

Mylist incrSize()
{
    int nsize;

    System.out.print("\\nEnter the value by which the size of array is to be increased : ");
    nsize = input.nextInt();

    Mylist tmp = new Mylist(nsize);

    for(int i = 0; i < this.a.length; i++)
        tmp.a[i] = this.a[i];

    System.out.println("\\nEnter the value of the new (extra) element...");

    for(int i = this.a.length; i < nsize; i++)
    {
        System.out.print("\\nEnter Element "+i+" : ");
        tmp.a[i] = input.nextInt();
    }
    return tmp;
}

Mylist insertpos()
{
    int v, pos;
    Mylist tmp = new Mylist(this.a.length + 1);

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        for(int i = 0; i < this.a.length; i++)
            tmp.a[i] = this.a[i];

        System.out.print("\nEnter the value to insert : ");
        v = input.nextInt();

        System.out.print("\nEnter the position to insert on : ");
        pos = input.nextInt();

        for(int i = this.a.length; i >= (pos-1); i--)
            tmp.a[i] = tmp.a[i-1];

        tmp.a[pos-1] = v;

        return tmp;
    }

    Mylist append(Mylist l)
    {
        int t = this.a.length + l.a.length;
        Mylist tmp = new Mylist(t);

        for(int i = 0; i < this.a.length; i++)
            tmp.a[i] = this.a[i];

        for(int i = this.a.length, j = 0; (i < t); i++, j++)
            tmp.a[i] = l.a[j];

        return tmp;
    }

    public static void main(String[] args)
    {
        int m, n;
        Scanner input = new Scanner(System.in);

        System.out.print("\nEnter the size of First list : ");
        m = input.nextInt();

        Mylist a = new Mylist(m);
        a.read();
        a.display();

        a = a.insertpos();

        a.display();

        System.out.print("\nEnter the size of Second list : ");
        n = input.nextInt();

        Mylist b = new Mylist(n);
        b.read();
        b.display();

        Mylist l = new Mylist(m+n);

        System.out.println("\n\nAppending both list...");
        l = a.append(b);

        l.display();
    }

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}  
}
```

```
// Point 1  
  
import java.util.Scanner;  
import java.lang.Math;  
  
class Point  
{  
    int x, y;  
  
    Point()  
    {  
        x = 0;  
        y = 0;  
    }  
  
    Point(int a)  
    {  
        x = y = a;  
    }  
  
    Point(int a, int b)  
    {  
        this.x = a;  
        this.y = b;  
    }  
  
    Point(Point p)  
    {  
        this.x = p.x;  
        this.y = p.y;  
    }  
  
    Point add(Point p)  
    {  
        Point n = new Point();  
  
        System.out.println("\nAdding (" + this.x + ", " + this.y + ") to (" + p.x + ", " + p.y + ")");  
        n.x = this.x + p.x;  
        n.y = this.y + p.y;  
  
        return n;  
    }  
  
    Point sub(Point p)  
    {  
        Point n = new Point();  
  
        System.out.println("\nSubtracting (" + this.x + ", " + this.y + ") and (" + p.x + ", " + p.y + ")");  
        n.x = this.x - p.x;  
        n.y = this.y - p.y;  
  
        return n;  
    }  
}
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Point incr()
{
    this.x += 1;
    this.y += 1;

    return this;
}

Point assign()
{
    Point n = new Point();

    n.x = this.x;
    n.y = this.y;

    return n;
}

boolean equal(Point p)
{
    if(this.x == p.x && this.y == p.y)
        return true;
    else
        return false;
}

float dist(Point p)
{
    float d;

    d = (p.x - this.x)*(p.x - this.x) + (p.y - this.y)*(p.y - this.y) ;
    d = (float)Math.sqrt(d);

    return d;
}

Point midPoint(Point p)
{
    Point n = new Point();

    System.out.println("\nFinding Midpoint of (" + this.x + ", " + this.y + ") and (" + p.x + ", " + p.y + ")");
    n.x = (this.x + p.x)/2;
    n.y = (this.y + p.y)/2;

    return n;
}

void read()
{
    Scanner input = new Scanner(System.in);

    System.out.print("\nEnter Value of X : ");
    x = input.nextInt();

    System.out.print("Enter Value of Y : ");
    y = input.nextInt();
}

void display()
{
    System.out.println("\nThe Point is (" + x + ", " + y + ")");
}

```

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}

public static void main(String[] args)
{
    Point a = new Point();
    Point b = new Point();
    Point p = new Point();

    boolean flag = true;
    int x = 0;
    float dis;

    Scanner input = new Scanner(System.in);

    System.out.print("\nEnter the value of point 1 : ");
    a.read();
    a.display();

    System.out.print("\nEnter the value of point 2 : ");
    b.read();
    b.display();

    a = b.assign();
    a.display();

    while(flag)
    {
        System.out.println("\nEnter \n1 to ADD both Points \n2 to SUBTRACT both Points \n3 to
find the MIDPOINT of both points \n4 to find DISTANCE between both Points ");
        System.out.println("\n5 to INCREASE Point 1 \n6 to INCREASE Point 2 \n7 to check if BOTH
Poits are EQUAL or not \n8 to Enter NEW Points \n9 to EXIT : ");
        x = input.nextInt();

        switch(x)
        {
            case 1 :
                p = a.add(b);
                p.display();
                break;
            case 2 :
                p = a.sub(b);
                p.display();
                break;
            case 3 :
                p = a.midPoint(b);
                p.display();
                break;
            case 4 :
                dis = a.dist(b);
                System.out.println("\nDistance Between both Point is "+dis);
                break;
            case 5 :
                a = a.incr();
                System.out.print("After Increament ");
                a.display();
                break;
            case 6 :
                b = b.incr();
                System.out.print("After Increament ");
                b.display();
                break;
        }
    }
}

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        case 7 :
            System.out.println("\nPoint 1 = Point 2 is "+a.equal(b)+"\n");
            break;
        case 8 :
            a.read();
            a.display();
            b.read();
            b.display();
            break;
        default :
            flag = false;
            break;
    }
}
}
}
}
}

```

```

//Point 2
import java.util.Scanner;
class Point{
    int x,y;

    Point()
    {
        x=0;y=0;
    }
    Point(int a)
    {
        x=y=a;
    }
    Point(int a,int b)
    {
        this.x=a;
        this.y=b;
    }
    Point(Point p)
    {
        this.x=p.x;
        this.y=p.y;
    }

    void read()
    {
        Scanner input = new Scanner (System.in);
        System.out.println("Enter Value of x : ");
        x=input.nextInt();
        System.out.println("Enter Value of Y : ");
        y=input.nextInt();
    }
    void display()
    {
        System.out.println("X : "+x+" Y : "+y);
    }

    Point add(Point p)
    {
        Point t = new Point();
    }
}

```



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        t.x=this.x+p.x;
        t.y=this.y+p.y;
        return t;
        // return new Point (this.x+p.x,this.y+p.y);
    }

    Point sub(Point p)
    {
        Point t = new Point();
        t.x=this.x-p.x;
        t.y=this.y-p.y;
        return t;
        // return new Point (this.x-p.x,this.y-p.y);
    }

    void Eq( Point p1, Point p2)
    {
        boolean ifequal = true;
        boolean ifnotequal = false;
        if(p1 == p2)
        {
            System.out.println(ifequal);
        }
        else
        {
            System.out.println(ifnotequal);
        }
    }

    Point ad(Point p)
    {
        Point t = new Point();
        t.x=this.x*p.x;
        t.y=this.y*p.y;
        return t;
    }

    public static void main(String[] args)
    {

        Point p1= new Point();
        Point p2= new Point(2);
        Point p3= new Point(2,3);
        Point p4= new Point(p3);

        p1.display();
        p2.display();
        p3.display();
        p4.display();
        p3.read();
        p3.display();
        Point a = new Point(p1.add(p2));
        a.display();
        Point b = new Point(p1.sub(p2));
        b.display();
        Point p5=new Point(p3);
        p4.Eq(p3,p4);
        Point ad = new Point(p3.ad(p4));
        ad.display();
    }
}

```

```

import java.util.Scanner;
class Complex {
    int x,y;
    Complex() {
        x=0;
        y=0;
    }

    Complex(int a) {
        x=y=a;
    }
    Complex(int x,int y) {
        this.x=x;
        this.y=y;
    }
    Complex(Complex m) {
        /*or
        x=m.x;
        y=m.y;
        */
        this.x=m.x;
        this.y=m.y;
    }
    void display() {
        System.out.println(x+" "+y+"i");
    }

    Complex add(Complex a)
    {
        Complex t = new Complex(); // to not change p1 & p2
        t.x = this.x + a.x;
        t.y = this.x + a.y;
        return t;
    }

    Complex sub(Complex a)
    {
        Complex t = new Complex(); // to not change p1 & p2
        t.x = this.x - a.x;
        t.y = this.x - a.y;
        return t;
    }

    void read()
    {
        Scanner input = new Scanner (System.in);
        System.out.println("Enter value of a : ");
        x=input.nextInt();
        System.out.println("Enter value of b : ");
        y=input.nextInt();
    }
    public static void main(String[] args) {
        Complex p1 = new Complex ();
        Complex p2 = new Complex (1);
        Complex p3 = new Complex (2,3);
        Complex p4 = new Complex (p3);

        p3.read();
        p3.display();
    }
}

/*
or
class Main
{
    public static void main(String[] args)
    {
        // have to save program as main.java
    }
}
*/

```

```

class Rational
{
    int num,den;

    Rational()
    {
        num=0;
        den=1;
    }
    Rational(int n,int d)
    {
        num=n;
        den=d;
    }
    int getnum()
    {

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        return num;
    }
    int getden()
    {
        return den;
    }

    // Display 1
    public String toString()
    {
        return "Rational no : "+num+"/"+den+" = "+num*1.00/den;
    }

    // Display type 2
    void display()
    {
        System.out.printf("Rational no : "+num+"/"+den+" = %.2f\n",num*1.00/den);
    }

    Rational add(Rational r)
    {
        Rational temp=new Rational();
        temp.num = (num * r.den) + (den * r.num);
        temp.den = (den* r.den);
        return temp;
    }

    Rational sub(Rational r)
    {
        Rational temp = new Rational();
        temp.num = (num * r.den) - (den * r.num);
        temp.den = (den* r.den);
        return temp;
    }

    Rational mul(Rational r)
    {
        Rational temp = new Rational();
        temp.num = (num * r.num);
        temp.den = (den* r.den);
        return temp;
    }

    Rational div(Rational r)
    {
        Rational temp = new Rational();
        temp.num = (num * r.den);
        temp.den = (den* r.num);
        return temp;
    }

    public static void main (String[] args)
    {
        Rational r1 = new Rational(4,6);
        Rational r2 = new Rational(5,15);
        System.out.println("First Rational no : ");
        System.out.println("Numerator : "+r1.getnum());
        System.out.println("Denominator : "+r1.getden());

        System.out.println("Second Rational no : ");
        System.out.println("Numerator : "+r2.getnum());
        System.out.println("Denominator : "+r2.getden());

        // Printing via -> public String toString()
        System.out.println(r1);
        System.out.println(r2);

        /*****Addition****/
        Rational r3 = r1.add(r2);
        System.out.println("Addition : ");
        System.out.println(r3); /***** Display type 1 ****/

        /*****Subtraction****/
        Rational r4 = r1.sub(r2);
        System.out.println("Subtraction : ");
        r4.display(); /***** Display type 2 ****/

        /*****Multiplication****/
        Rational r5 = r1.mul(r2);
        System.out.println("Multiplication : ");
        r5.display(); /***** Display type 2 ****/

        /*****Division****/
        Rational r6 = r1.div(r2);
        System.out.println("Division : ");
        r6.display(); /***** Display type 2 ****/
    }
}

```

