# SHEET 2 SOLUTIONS

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1.                                                             (**Vector.java** on GitHub)

```java
import java.util.Scanner;
public class Vector {
    double x;
    double y;

    // Default constructor
    public Vector(){
        x = 0;
        y = 0;
    }
    // Parametrized constructor
    public Vector(double x, double y){
        this.x = x;
        this.y = y;
    }
    // x & y getters
    public double getX(){
        return x;
    }
    public double getY(){
        return y;
    }
    // x & y setters
    public void setX(double x){
        this.x = x;
    }
    public void setY(double y){
        this.y = y;
    }
    // Magnitude method
    double magnitude(){
        return Math.sqrt((Math.pow(x,2) + Math.pow(y,2)));
    }
    // Angle method
    double angle(){
        return Math.toDegrees(Math.atan(y / x));
    }
    // printing method
    void print(){
        System.out.println("Vector in cartesian form: " + x + "i + " + y + "j");
        System.out.println("Vector in polar form: " + magnitude() + "[" +
angle() + "]");
    }
    // Vector addition method
    Vector add(Vector v){
        double newX = this.x + v.x;
        double newY = this.y + v.y;
        return new Vector(newX, newY);
    }
```

```java
        // Vector subtraction method
        Vector sub(Vector v){
            double newX = this.x - v.x;
            double newY = this.y - v.y;
            return new Vector(newX,newY);
        }

        // main method
        public static void main(String[] args){


          // test cases
            Vector myVector = new Vector(4,5); // vector declaration
            double xValue = myVector.getX(); // x value getter
            double yValue = myVector.getY(); // y value getter
            System.out.println("x: " + xValue + " y: " + yValue); // print x & y values
            myVector.print(); // print method
            myVector.setX(3); // x value setter
            myVector.setY(2); // y value setter
            System.out.println("new x: " + myVector.getX() + " new y: " +
myVector.getY()); // print new x & y values
            myVector.print(); // print method
            double magValue = myVector.magnitude(); // magnitude method
            double angleValue = myVector.angle(); // angle method
            System.out.println("magnitude = " + magValue + " angle = " + angleValue);
// print magnitude & angle
            Vector myVector2 = new Vector(1,1); // new vector declaration
            Vector summedVector = myVector.add(myVector2); // vector addition method
            summedVector.print(); // print method
            Vector subbedVector = myVector.sub(myVector2); // vector subtraction method
            subbedVector.print(); // print method

            System.out.println("---------------------------------------------");
            // test for a user input:
            Scanner input = new Scanner(System.in);
            System.out.println("Enter x value: ");
            double x = input.nextDouble();
            System.out.println("Enter y value: ");
            double y = input.nextDouble();
            input.close();
            Vector userVector = new Vector(x,y);
            userVector.print();
        }
    }
```

2.

```java
public class ArrayMagnitude extends Vector{
    // average magnitude method
    public static double averageMagnitude(Vector[] vectors){
        double sum = 0;
        for (Vector vector : vectors){
            sum += vector.magnitude();
        }
        return sum / vectors.length;
}

    // main method
    public static void main(String[] args){
        // test cases
        Vector[] vectors = new Vector[3];
        vectors[0] = new Vector(3,4);
        vectors[1] = new Vector(4,5);
        vectors[2] = new Vector(5,6);
        System.out.println("Average magnitude: " +
averageMagnitude(vectors));
    }
}
```

This concludes Sheet (2) Solutions, this document + source code to all programming exercises available on  https://bit.ly/CSE231Sheets .