

Worksheet: 3d Vector Class

Below is our previous **Vector** class code.

Code Block 1: The Vector class

```

1 public class Vector {
2     public double x;
3     public double y;
4     public Vector(double x, double y) {
5         this.x = x;
6         this.y = y;
7     }
8     public void add(Vector v) {
9         this.x += v.x;
10        this.y += v.y;
11    }
12 }
```

Update the **Vector** class so that it may be used to store either two-dimensional vectors or three-dimensional vectors. Accomplish this by updating in the following ways:

- Add a third instance field, named **z**, of type **double** to hold the third dimension of the vector.
- Update the **add** method to account for the additional **z** dimension.
- **Overload** the **add** method with a method that takes in three double parameters (use the names **x**, **y**, and **z**), and add these values to the vector.
- **Overload** the constructor with a second constructor that takes three parameters of type **double** to initialize the three instance fields. (Leave the original constructor so that the user of the class need not initialize the third dimension, but rather leave the value as zero).
- Add a method named **length** that returns the calculated length of the vector as a type **double**. (The length of a vector, **d**, is given by the formula: $d = \sqrt{x^2 + y^2 + z^2}$).

A UML class diagram of the original **Vector** class and the updated **Vector** class are given here:

Original Vector Class

Vector
+x: real +y: real
+Vector(x: real, y:real) +add(v: Vector)

Updated Vector Class

Vector
+x: real +y: real +z: real
+Vector(x: real, y:real) +Vector(x: real, y:real, z:real) +add(v: Vector) +add(x: real, y:real, z:real) +length()

Write the Java code for the updated **Vector** class on the reverse of this page.

Worksheet: 3d Vector Class

```
public class Vector3d {  
  
    public double x;  
    public double y;  
    public double z;  
  
    public Vector3d(double x, double y) {  
        this.x = x;  
        this.y = y;  
    }  
  
    public Vector3d(double x, double y, double z) {  
        this(x,y);  
        this.z = z;  
    }  
  
    public void add(Vector3d v) {  
        this.x += v.x;  
        this.y += v.y;  
        this.z += v.z;  
    }  
  
    public void add(double x, double y, double z) {  
        this.x += x;  
        this.y += y;  
        this.z += z;  
    }  
  
    public double length() {  
        return Math.sqrt(x*x + y*y + z*z);  
    }  
}
```