Metropolitan State University, St. Paul, MN
ICS 372 Object-Oriented Design and Implementation
Class Exercise 1 Solution

7. The following method is supposed to return the area of a rectangle, given its length and width. Is the code cohesive? If not, rewrite the code to make it more cohesive.

```
public double computeArea(double length, double width) {
   double area = length * width;
   System.out.println("The area is" + area);
   return area;
}
```

The line

```
   System.out.println("The area is" + area);
```

is inappropriate. The method is supposed to compute and return the area. Printing the area is not one of this method's functions. The coder of the method does not necessarily know what the area is used for. There may be no need to display the area at all and if the interface is command line, the display will be extraneous. If the interface is a GUI and the display is essential, this line will not be of much use.

So this line should be removed. The new code is

```
public double computeArea(double length, double width) {
  double area = length * width;
  return area;
}
```

8. Write the skeleton of a class named `DiskDrive`.

```
public class DiskDrive {
}
```

9. Use the most appropriate data type to define a variable named `time` that can store integers in the range (-99999, +99999).

```
int time;
```

10. Use the most appropriate data type to define a variable named `numberOfAccesses` that can store integers in the range (0, 1 billion).

```
int numberOfAccesses;
```

11. Use the most appropriate data type to define a variable named `errorRange` that can store integers in the range (-32, +32).

```
byte errorRange;
```

12. Use the most appropriate data type to define a variable named `name` that can store the name of a person.

```
String name;
```

13. Use the most appropriate data type to define a variable named `middleInitial` that can store the middle initial of a person.

```
char middleInitial;
```

14. Use the most appropriate data type to define a variable named `middleInitial` that can store the middle initial of a person.

```
char middleInitial;
```

15. Use the most appropriate data type to define the success of checking whether a student has completed graduation requirements.

```
boolean meetsRequirements;
```

16. Declare a class named `Point` that stores the x and y coordinates of a location on a plane. The class should have methods to set and get the x coordinate.

```
public class Point {
  private int x;
  private int y;
  public void setX(int newX) {
    x = newX;
  }
  public int getX() {
    return x;
  }
}
```

17. Code a syntactically and semantically correct constructor for a (correct) answer to Question 16. It should be possible to instantiate an object as below.

```
Point myPoint = new Point(<x-coord>, <y-coord>);

public class Point {
  private int x;
  private int y;
  public Point(int xValue, int yValue) {
```

```
    x = xValue;
    y = yValue;
  }
  public void setX(int newX) {
    x = newX;
  }
  public int getX() {
    return x;
  }
}
```

18. Write a constructor for a (correct) answer to Question 16 in which there are no arguments, but initializes x and y coordinates to both 1. It should be possible to instantiate an object as below.

```
Point myPoint = new Point();

public class Point {
  private int x;
  private int y;
  public Point(int xValue, int yValue) {
    x = xValue;
    y = yValue;
  }
  public Point() {
    this(1, 1);
  }
  public void setX(int newX) {
    x = newX;
  }
  public int getX() {
    return x;
  }
}
```

19. Suppose we have two classes Employee and Project. An employee can be assigned to multiple projects and a project can have multiple employees. Every project has a name and a budget. For every employee, each project assignment has a fraction assigned to the appointment, which shows the fraction of time the employee works on the project. For example, if Smith works on three projects EdgeMart, BadSale, and Tears, these fractions could be 0.3, 0.25, and 0.45, meaning that Smith works 30% of the time on EdgeMart, 25% of the time on BadSalem and 45% of the time on Tears. Show the Java code that organizes these entities and their relationships.

```
public class Employee {
  private Assignments[] assignments;
}
```

```
public class Project {
  private String name;
  private double budget;
  private Assignment[] assignments;
}

public class Assignment {
   private Employee employee;
   private Project project;
   private double load;
   // constructors and getters and setters
}
```

20. Predict the output.

```
public class A {
    public A() {
      System.out.println("A constructor");
    }
    public void f() {
       System.out.println("In A f");
    }
    public void g() {
       B b1 = new B(this);
    }
}
public class B {
    public B(A a) {
       System.out.println("B constructor");
       a.f();
    }
}
public class CE1 {
   public static void main(String[] args) {
      A a1 = new A();
      a1.g();
   }
}
```

```
A constructor
B constructor
In A f
```

21. Which of the following are true of interfaces? Check all that apply.

    (a) They have abstract methods (for the purposes of this class) ✓

(b) They can have final static fields ✓

(c) Implementing classes inherit the type ✓

(d) They have public members ✓

22. Consider the following code.

```
public interface I1 {
   public void m1();
}
public interface I2 {
   public void m2(int x);
}
public class C1 implements I1, I2 {
// code
}
public class C2 implements I2 {
}
```

Complete the implementation of class `C1`, so it compiles correctly.

```
public class C1 implements I1, I2 {
   public void m1() {
   }
   public void m2(int x) {
   }
}
```

23. Suppose we have the following declarations, which compile error-free.

```
C1 obj1 = new C1();
C2 obj2 = new C2();
```

Assume the declarations in Question 22. Which of the following are valid? Check all that apply.

(a) `I1 x = obj1;` ✓

(b) `I2 x = obj1;` ✓

(c) `I1 x = obj2;`

(d) `I2 x = obj2;` ✓