Exam 2 - CS 112 - Fall 2017 - Section 02

Name:

You are reminded that you are required to uphold the USF Academic Honor Pledge below.

"*I pledge to demonstrate the core values of the University of San Francisco by upholding the standards of honesty and integrity, excellence in my academic work, and respect for others in my educational experiences, including supporting USF's mission.*"

Question	**Awarded**	**Question**	**Awarded**
Multiple Choice and True/False - 2 points per question			
1		4	
2		5	
3			
Short Answer - 5 points per question			
6		10	
7		11	
8		12	
9		13	
Programming - 10 points per question			
14		17	
15		18	
16			
		Total	

1. Which of the following classes have an “is-a” relationship? Select all that apply.
    a. `Glasses` and `Sunglasses`
    b. `Beverage` and `OrangeJuice`
    c. `Dog` and `Tail`
    d. `Office` and `Phone`
    e. `EmailMessage` and `Subject`

2. Which of the following keywords is used by a child class to inherit the properties from a base case?
    a. `super`
    b. `this`
    c. `extends`
    d. `implements`

3. Which of the following are valid declarations of an array. Select all that apply.
    a. `Name[] names = new Name[10];`
    b. `int[] values = new double[10];`
    c. `Pixel[] pix = new Pixel[25]`
    d. `Comparable[] values = new Comparable[5];`

4. True / False - A data member may be declared without specifying an accessibility modifier.

5. True / False - An `abstract` method cannot be overridden.

6. How many `USFPerson` objects are created when the following line of code executes?

```
USFPerson[] people = new USFPerson[10];
```

7. Write one or more lines of code that will create a new `USFStudent` object and store a reference to the object in the first cell of an array called `people` (see question 6 for an example of how the array would be instantiated). The `USFStudent` constructor accepts the following values, and you may use whichever values you choose: `String name, int id, double gpa, String major`

8. What is the output of the following code fragment?

```
String s1 = "dog";
String s2 = "alpaca";
System.out.println(s1.compareTo(s2));
```

9. What is an advantage of using inheritance in a Java program?

10. What is the output of the following program?

```
public class ArraysAndMethods {
	public void addFour(int[] nums) {
		int[] newNums = new int[nums.length];
		for(int i = 0; i < nums.length; i++) {
			newNums[i] = nums[i] + 4;
		}
	}

	public static void main(String[] args) {
		int[] mainNums = {4, 5, 3, 4, 5, 1, 10};
		ArraysAndMethods aam = new ArraysAndMethods();
		aam.addFour(mainNums);
		System.out.println(mainNums[mainNums.length-2]);
	}
}
```

11. The following three questions refer to the two classes below.

```
public abstract class Bicycle {
    protected int cadence;
    protected int gear;
    protected int speed;

    public Bicycle(int startCadence, int startSpeed, int startGear) {
        gear = startGear;
        cadence = startCadence;
        speed = startSpeed;
    }

    public void speedUp(int increment) {
        speed += increment;
    }

    public void printDescription(){
        System.out.println("\nBike - " + "in gear: " + this.gear
            + " speed: " + this.speed + ".");
    }
}
public class RoadBike extends Bicycle{
    private int tireWidth;

    public RoadBike(int startCadence, int startSpeed,
                    int startGear,int newTireWidth){
        super(startCadence,
              startSpeed,
              startGear);
        this.setTireWidth(newTireWidth);
    }

    public int getTireWidth(){
      return this.tireWidth;
    }

    public void setTireWidth(int newTireWidth){
        this.tireWidth = newTireWidth;
    }

    public void printDescription(){
        super.printDescription();
        System.out.println("RoadBike - " + getTireWidth() +
            " MM tires.");
    }
}
```

11. What is the output of the following code fragment? If a statement will cause an error, indicate that as well and provide a short description of the error making sure to note whether it is a compiler or runtime error.

```
Bicycle b1 = new RoadBike(40, 20, 8, 23);
b1.printDescription();
b1.setTireWidth(25);
b1.printDescription();
```

12. What is the output of the following code fragment? If a statement will cause an error, indicate that as well and provide a short description of the error making sure to note whether it is a compiler or runtime error.

```
RoadBike b2 = new RoadBike(40, 20, 8, 23);
b2.printDescription();
b2.speedUp(2);
b2.printDescription();
```

13. What is the output of the following code fragment? If a statement will cause an error, indicate that as well and provide a short description of the error making sure to note whether it is a compiler or runtime error.

```
Bicycle b3 = new RoadBike(40, 20, 8, 23);
b3.speedUp(2);
System.out.println(b3.toString());
```

14. Write a method `makeEnds` that takes as input an array of `int` and returns a new array int of length 2 containing the first and last elements from the original array. The original array will be length 1 or more. Examples:

```
makeEnds([1, 2, 3]) → [1, 3]
makeEnds([1, 2, 3, 4]) → [1, 4]
makeEnds([7, 4, 6, 2]) → [7, 2]
```

15. Write a method `twoA` that takes as input an array of `char` and returns `true` if every character ‘a’ that appears in the array is next to another character ‘a’. Examples:

```
twoA([‘c’, ‘a’, ‘a’, ‘d’]) → true
twoA([‘a’, ‘a’, ‘b]) → true
twoA([‘a’, ‘a’, ‘b’, ‘a’]) → false
```

16. This question asks you to implement a method for the `StringList` class as defined as in Lab 5. As a reminder, the class was defined with the following data members.

```
public class StringList {

      //an array that maintains a list of String objects
      //the default initial size of the array is 10
      private String[] strings;

      //the number of valid String objects stored in the
      //array of strings
      private int count;
}
```

Implement a method `addAfter` that takes as input two `String` objects `newString` and `existingString` and and inserts `newString` directly after the *last* instance of `existingString`. If `existingString` does not exist in the array your method will return without making any change. You may not rely on *any* other methods of the class. The following shows the state of the instances variables before and after a call to `addAfter("zebra", "cat")`.

Before:

`strings -> {"cat", "dog", "cat", "bird", "cat", "alpaca", null, null, null, null}, count=6`

After:

`strings -> {"cat", "dog", "cat", "bird", "cat", "zebra", "alpaca", null, null, null}, count=7`

The next question asks you to implement a method that uses the `Picture` and `Pixel` classes you used for Project 2. As a hint, methods that can be called on a `Pixel` include `getRed`, `getBlue`, and `getGreen`. Methods that can be called on a `Picture` include `getPixel`, `setPixel`, `getWidth`, and `getHeight`. You will need to remember the parameters required by those methods.

17. Implement a method `stripes` that takes as input an original `Picture` object and returns a new `Picture` of the same dimensions where the pixels in even rows are the same as the original picture and the pixels in odd rows are set to red. In the example below, R represents a pixel with red value 255 and green and blue value 0.

Example input:	Example output:
`aaaa`	`aaaa`
`bbbb`	`RRRR`
`cccc`	`cccc`
`dddd`	`RRRR`

18. Modify the `Bicycle` class defined in question 11 so that it implements the `Comparable` interface. You will need to implement a `compareTo` method. Bicycles should be first ordered by speed, smallest to largest. If speed is the same, then order by gear, smallest to largest. You do **not** need to re-write the constructor or `speedUp` or `printDescription` methods in your solution.