CS 1316 - Exam 2 - Spring 2010

Name: ____________________________________

Grading TA: ______________________________ **Section:** __________

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- Do your best to prevent anyone else from seeing your work.
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- Do NOT share ANYTHING during the exam. (This includes no sharing of pencils, paper, erasers).
- Follow directions given by the proctor(s).
- Stop all writing when told to stop. Failure to stop writing on this exam when told to do so is academic misconduct.
- Do not use notes, books, calculators, etc during the exam.

I commit to uphold the ideals of honor and integrity by refusing to betray the trust bestowed upon me as a member of the Georgia Tech community.

Signature: ____

Problem	Points Earned	Points Possible	Grader Initials
1. Vocabulary		12	
2. Short Answers		8	
3. Turtle Graphics		8	
4. Slash Picture		12	
5. Mystery Sound		8	
6. Inheritance Question		6	
TOTAL:		54	

Exam Percentage: _________ / 54 = ________ %

1. Vocabulary (12 points)

For each of the following words, write a 1-2 sentence definition of the word as used in this class. Your definition should be concise and to the point, while demonstrating that you know what the term means.

(3 points each)

a) constructor - A specialmethod that gets called when a new instance of an object is created. It must have the same name as the class.

b) inheritance - The process in which a subclass "borrows" or "inherits" behaviors and fields from it's superclass.

c) overriding (a superclass method) – Redefining a method in a subclass instead of inheriting the method from the superclass. The subclass' version will be called instead of the superclass version.

d) queue – An abstract data type that acts in a FIFO (first in, first out) manner.

2. Short Answers (8 points)

For each of the following questions, write a 1-4 sentence answer.

a. A sound is made up of SoundSamples stored in an array. Each SoundSample has a value associated with it, ranging in size from -32768 to 32767. (1point each, accept approximations near 32K)

b. What is the default sampling rate (in samples per second) of the Sound class?

In the Sound class the default sampling rate is 22,050 samples per second. (3 points)

c. What happens if you double the value of every SoundSample in a sound?

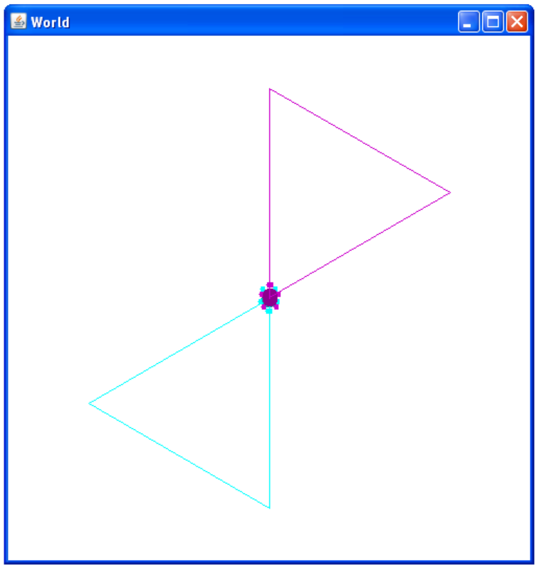
If you double the sound value at every value the sound's volume/amplitude will double. (2 points)

d. How would you double the frequency of a sound stored in a Sound object?

To double the frequency you can double the sampling rate or you can remove every other value. (1 point)

3. Turtle Graphics (8 Points)

Create a new class named BowTie that contains a main method that will create the image below when it is run. You must use ***two*** turtles and only ***one*** for loop to create the drawing. Each "leg" of the bow-tie is 200 pixels in length. The World measures 500 by 500 pixels. (You do ***not*** need to specify the color of the turtles.)



```
public class BowTie {
public static void main(String[]args){
 World universe = new World(500,500);
    Turtle fred = new Turtle(universe);
    Turtle barney = new Turtle(universe);
    fred.turn(180);
    for(int i = 0; i<3; i++){
      fred.forward(200);
      barney.forward(200);
      barney.turn(120);
      fred.turn(120);
    }
  }
}
```

Grading

+ 2 – correct class definition
+ 2 – using only one loop
+ 2 – drawing two triangles
+ 2 – correct bowtie shape and orientation

4. Slash Picture (12 points)

Write a class called SlashPicture that is a subclass of the Picture class you've been working with on your homework. SlashPicture should have a constructor that takes in a String for the file name and calls the superclass constructor with that String.

SlashPicture should also have an object method called *drawSlash* that takes in no parameters and draws a diagonal black line (or slash) across the image from the upper left corner to the lower right corner. The line should be one pixel wide, and should go from corner to corner. Note: you may assume that the image you're modifying will be perfectly square-shaped (the width and height are equal) The method acts by modifying the picture, and should return nothing.

```
public class SlashPicture extends Picture {

  public SlashPicture(String filename) {
    super(filename);
  }

  public void drawSlash() {
    for(int i=0; i<this.getHeight();i++) {
      Pixel p = this.getPixel(i,i);
      p.setRed(0);
      p.setGreen(0);
      p.setBlue(0);
    }
  }
}
```

Grading:
+ 2 – correctly declaring the SlashPicture class that extends Picture
+ 2 – correct constructor that calls super with input String
+ 1 – correct method signature
+ 3 – changing the correct pixels to draw a slash
+ 2 – setting the pixels to black
+ 2 – using the keyword this or directly calling the Picture class methods without an implied object

5. Mystery Sound (8 points)

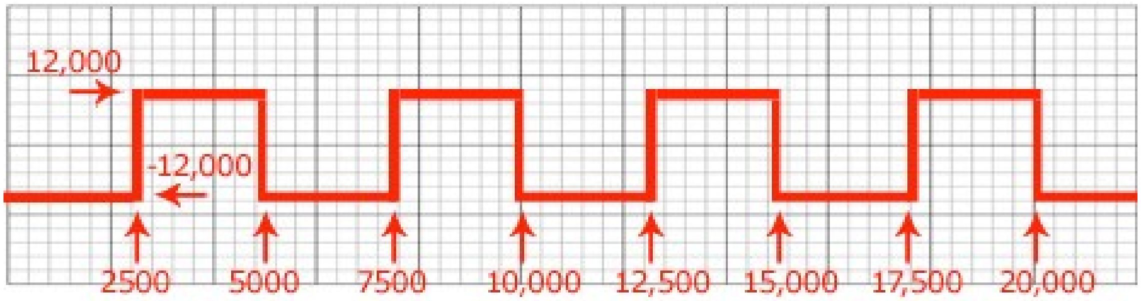
Here is a Mystery method from the Sound class:

```
public static Sound mystery(double time, int wavelength){
  int rate = 22050;
  Sound ret = new Sound((int) (time*rate));

  int currVal = 12000;
  SoundSample currSample;
  SoundSample[] samples = ret.getSamples();

  for(int i=0; i<samples.length; i++){
    if(i%wavelength==0){
      currVal = -1 * currVal;
      currSample = samples[i];
      currSample.setValue(currVal);
    }
    else {
      currSample = samples[i];
      currSample.setValue(currVal);
    }
  }
  return ret;
}
```

What does the following block of code produce?

```
Sound s = Sound.mystery(1 , 2500);
s.explore();
```

Fill in the graph below with the sound. Draw the line that represents the sample values, and label any high and low points with the sample values at those points. Also label the x position (or sample number) of any zero crossing points.



Grading

+ 2 – correct general shape (square wave)

+ 1 – starting at negative minimum value

+ 1 – four lines at max value, five lines at minimum

+ 2 – noting max value is 12,000 and minimum value is -12,000

+ 2 – indicating 2500 samples between each zero crossing

6. Inheritance Question (6 points)

Examine the following class definitions:

```
public class Person{
  private int age;
  private double weight;
  public double height;
  public String name;

  public Person(){
    age = 0;
    weight = 3.0;
    height = 0.9;
    name = "Child";
  }

  public Person(int a, double w, double h, String n){
    age = a;
    weight = w;
    height = h;
    name = n;
  }

  public void personMethod(){
    System.out.println(name + " says hello!");
  }
}
```

```
public class Student extends Person{
  public int year;
  public double gpa;
  public String major;

  public Student(int age,
      double weight,
      double height,
      String name){
    super(age,weight,height,name);
    year = 1;
    gpa = 4.0;
    major = "Undecided";
  }
}
```

Would either of the following object instantiations generate an error when entered in the interactions pane? Circle the line(s) that cause an error and explain why or write “No errors” if both would run without a problem.

>> Student s = new Student(); Default constructors are not automatically inherited
>> Student p = new Student(18, 130.0, 6.0, "George P. Burdell");

Now, assume that the “stu” variable points at a properly initialized Student object. Would any of the following lines generate an error when entered into the interactions pane? Circle the line(s) that cause an error and explain why or write “No errors” if all the lines would run without a problem.

>> int myAge = stu.age; Superclass private variables are not accessible from subclasses
>> String myDescrip = stu.name + " is a " + stu.major + " student.";
>> stu.weight += 15.0; Superclass private variables are not accessible from subclasses
>> stu.personMethod();

Grading:
+ 0.5 point for correctly indicating each line that cause an error
+ 1 for each correct error explanation