CS 305j – Midterm 1 – Fall 2008

Your Name_____

Your UTEID _____

Circle you TA's name: Ann   Alex

Instructions:
1. Please turn off your cell phones
2. There are 7 questions on this test.
3. You will 50 minutes to complete the test.
4. You may not use a calculator.
5. Please make your answers legible.
6. When code is required, write Java code.
7. The proctors will not answer questions.

1. Expressions. 2 points each, 18 points total. For each Java expression in the left hand column, indicate its value in the right hand column. **Be sure to show a constant of the appropriate type. For example, 7.0 rather than 7 for a double and "7" instead of 7 for a String.**

A.   `2 + 3 * 2`   _____

B.   `2.5 + 10 / 3`   _____

C.   `17 / 5`   _____

D.   `1 + 2 + "UT"`   _____

E.   `5 % 12 * 3 / 2`   _____

F.   `"CS" + 3 + 7`   _____

G.   `5.0 / 2 + 3`   _____

H.   `5 / 2 + 10 / 4`   _____

I.   `10 - 12 * 5 / 2`   _____

2. Parameters Simulation. 14 points. Consider the following program.

```java
public class ParameterQuestion{

    public static void main(String[] args){
        int x = 2;
        int y = 5;
        System.out.println( one(x, 10, y) );

        two(x, y);
        System.out.println( x + " " + y );

        int a = 3;
        int b = 2;
        two(b, a);
        System.out.println( a + " " + b );

        x = 3;
        y = four(x, x);
        System.out.println( y );
    }

    public static int one(int a, int b, int c){
        return Math.max( a, Math.max(b, c) );
    }

    public static void two(int a, int b){
        a++;
        b--;
        System.out.println( a + " " + b );
    }

    public static int three(int a){
        int x = a * 2;
        return x;
    }

    public static int four(int a, int b){
        a = a / 2;
        b = three(a) + three(b);
        System.out.println( a + " " + b );
        return a;
    }
}
```

List below the output produced by this program when it is run.

3. Loops Simulation. 8 points. Consider the following method:

```
public static int loop(int val){
     int result = 0;
     for(int i = 1; i <= val; i++){
          result += i * 2;
     }
     return result;
}
```

For each method call below what value is returned?

Method Call   Value Returned

loop(0);   _____

loop(1);   _____

loop(2);   _____

loop(4);   _____

4. Simulation. 10 points. Sketch the drawing panel window that is produced when the following program when is run. Do not worry about the title bar.

```java
import java.awt.*;

public class Draw{

    public static final int SIZE = 400;
    public static final int NUM_LINES = 4;

    public static void main(String[] args){
        DrawingPanel p = new DrawingPanel(SIZE, SIZE);
        Graphics g = p.getGraphics();
        int inc = SIZE / NUM_LINES;
        int end = inc;

        // parameters on drawLine are the x and y coordinates of the
        // two endpoints of the line: x1, y1, x2, y2

        for(int i = 1; i <= (NUM_LINES - 1); i++){
            g.drawLine(end, 0, end, SIZE);
            g.drawLine(0, end, SIZE, end);
            end = end + inc;
        }

        // parameters on drawOval are x coordinate, y coordinate,
        // width, and height

        g.drawOval(0, 0, SIZE, SIZE);
        g.drawOval(inc, inc, (inc * 2), (inc * 2) );
    }
}
```
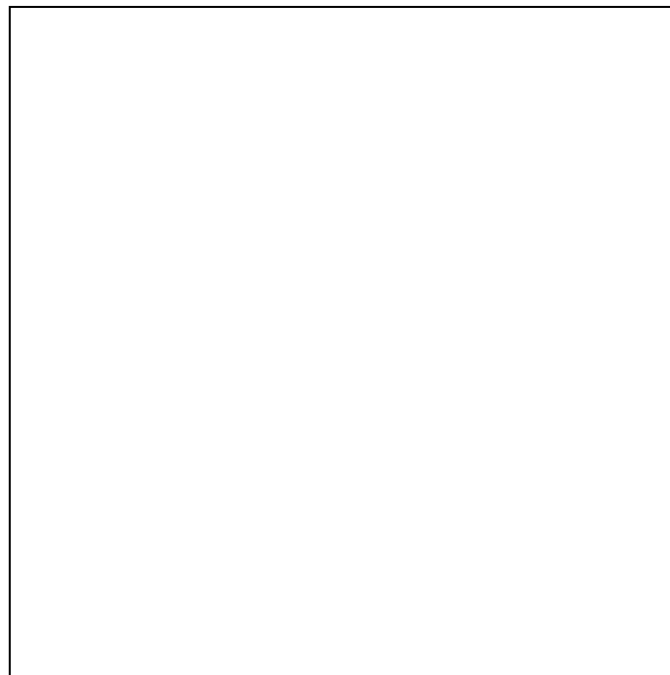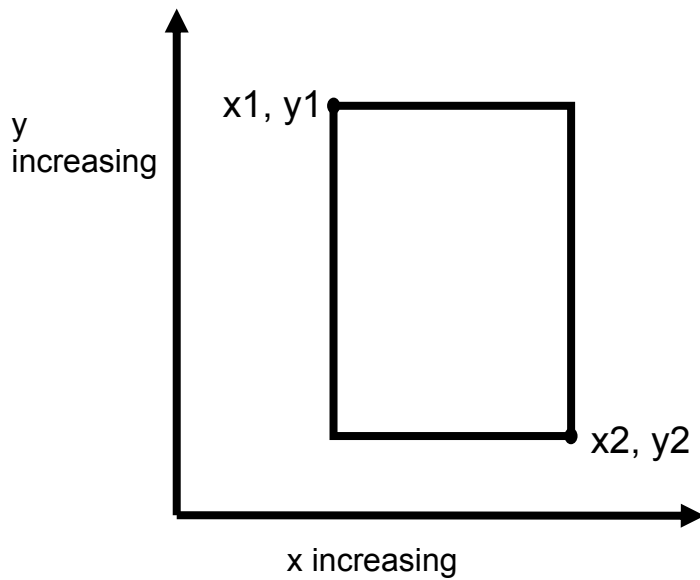
Sketch your DrawingPanel produced by the program in the box to the right. Recall the origin is at the top left corner and y increases as you go down.

5. Programming. 10 points. Write a method that given the upper left and lower right coordinates of a rectangle on a Cartesian plane, returns the area of that rectangle.

x increasing

Examples of results of method:

```
getArea(0.0, 4.0, 5.0, 0.5) returns 17.5
getArea(0.0, 4.0, 1.0, 0.0) returns 4.0
getArea(-2.5, 4.0, 2.5, -4.0) returns 40.0
```

Complete the method below:

```
// x1 and y1 indicate the upper left corner of the rectangle
// x2 and y2 indicate the lower right corner of the rectangle
public static double getArea(double x1, double y1,
                             double x2, double y2){
```

6. Programming. 15 points. Harry Potter Money. In the Harry Potter Series of books the money in the wizarding world consists of bronze Knuts, silver Sickles, and gold Galleons.

1 Sickle is worth 29 Knuts
1 Galleon is worth 17 Sickles
Based on these units 1 Galleon is worth 29 * 17 = 493 Knuts.

Write a method that given a number of Knuts prints out the equivalent number of Galleons, Sickles, and Knuts. The method prints out what the equivalent is in the fewest number of coins. (Galleons, Sickles, and Knuts are abbreviated to G, S, and K.)

Here are some examples of expected output:

`showMoney(493)` results in the following output:
```
493 Knuts is 1 G, 0 S, 0 K
```

`showMoney(16)` results in the following output:
```
16 Knuts is 0 G, 0 S, 16 K
```

`showMoney(20)` results in the following output:
```
20 Knuts is 0 G, 1 S, 3 K
```

`showMoney(1100)` results in the following output:
```
20 Knuts is 2 G, 6 S, 12 K
```

Complete the method below. There is more room on the next page if you need it.

```
// knuts is the number of knut coins.
// knuts will be greater than or equal to 0
public static void showMoney(int knuts){
```

7. Programming. 25 points.

The harmonic series is the infinite series shown below:

$1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{6}...$ also written as $\sum_{i=1}^{\infty} \frac{1}{i}$

Write a method that given an int `num`, displays the first `num` terms in the harmonic series and shows the sum of those first `num` terms.

Examples of output:

`showTerms(1)` results in the following output:
```
1 = 1.0
```

`showTerms(2)` results in the following output:
```
1 + 1/2 = 1.5
```

`showTerms(3)` results in the following output:
```
1 + 1/2 + 1/3 = 1.8333333333333333
```

`showTerms(8)` results in the following output:
```
1 + 1/2 + 1/3 + 1/4 + 1/5 + 1/6 + 1/7 + 1/8 = 2.7178571428571425
```

Note, there is one space on either side of each plus sign and the equals sign. There are not spaces between the numbers and the divide symbol.

Complete the method below. There is more room on the next page if you need it.

```
// num is greater than or equal to 1
public static void showTerms(int num){
```

Scratch Paper