CS 312 – Midterm 1 – Fall 2013

Your Name: _____

Your UTEID: _____

Circle your TA's Name: EDAENA LEIF MUBASHIR

Problem Number	Topic	Points Possible	Points Off
1	Expressions	18	
2	Code Tracing	18	
3	Tracing Graphics Programs	10	
4	Writing Methods (Loop - Figure)	20	
5	Programming Using Graphics	20	
6	Programming - Conditionals	15	
7	Method Tracing	10	
8	Programming - Return Methods	10	
	TOTAL POINTS OFF:		
	SCORE OUT OF 121:		

Instructions: ADD FOR ANSWERS ON TEST, FINISHING -> ID, PROCTOR

1. Please turn off your cell phones
2. There are 8 questions on this test.
3. You have 2 hours 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. Style is not evaluated when grading.
8. The proctors will not answer questions. If you believe a question has an error or is ambiguous, state your assumption and answer based on your assumption.
9. The exam is worth 121 points. Grades will be scaled to 150 for gradebook.

1. Expressions. 1 point each, 18 points total. For each Java expression in the left hand column, indicate the result of the expression in the right hand column.
You must show a value of the appropriate type. For example, 7.0 rather than 7 for a double and "7" instead of 7 for a String. Answers that do not indicate the data type correctly are wrong.

A. `4 * 5 + 100 / 20 + 3 * 2` _____

B. `17 / 8 + 3` _____

C. `60 / ((3 + 2) * 3)` _____

D. `60 / 3 + 2 * 3` _____

E. `1.5 + 3 / 2` _____

F. `4.5 / 1.5` _____

G. `27 % 5` _____

H. `7 % 33 * 3 + 8 % 24` _____

I. `1050 % 10` _____

J. `127 % 10 + 3 * 2.0` _____

K. `5 * 6 + (12 % 2 * 7)` _____

L. `"CS" + "CNS" + "12"` _____

M. `"JAVA" + "java"` _____

N. `"UT" + (3.7 + 1.2)` _____

O. `5 - 3 + "GDC" + 6 + 3` _____

The `Math` methods `ceil`, `floor`, `sqrt`, and `abs` all return `doubles`.

P. `Math.sqrt(25) + 3` _____

Q. `Math.floor(-1.2) + Math.ceil(3.85)` _____

R. `Math.abs(0) + Math.abs(-4.5)` _____

2. Code tracing. 2 points each, 18 points total. Place you answer in the box to the right of the code

A. What is output by the following code when it is run?

```
int xa = 2;
xa = 10;
xa = xa - 5;
xa++;
System.out.print(xa);
```

B. What is output by the following code when it is run?

```
int xb = 5;
int yb = 3;
int zb = xb + yb;
xb = zb + xb;
zb = 3 * yb;
System.out.print(xb + " " + yb + " " + zb);
```

C. What is output by the following code when it is run?

```
int xc = 7;
int yc = 5;
yc = xc;
xc = yc;
System.out.print(xc + " " + yc);
```

D. What is output by the following code when it is run?

```
int xd = -2;
int yd = 3;
yd += xd * yd + 2;
System.out.print(xd + " " + yd);
```

E. What is output by the following code when it is run?

```
int xe = 3;
int ye = 10;
int ze = 2;
ze *= ye - xe * 2;
System.out.print(ze);
```

F. How many asterisks does the following code print out?
Don't show the output. Simply state the number of asterisks that are printed out when the code runs.

```
for(int i = 1; i <= 10; i++) {
    for(int j = 1; j <= 5; j++) {
        System.out.print("*");
    }
}
```

G. How many asterisks does the following code print out?
Don't show the output. Simply state the number of asterisks that are printed out when the code runs.

```
for(int ig = -2; ig <= 6; ig++) {
    for(int jg = 1; jg <= ig; jg++) {
        System.out.print("*");
    }
}
```

H. How many asterisks does the following code print out?
Don't show the output. Simply state the number of asterisks that are printed out when the code runs.

```
for(int ih = -2; ih < 3; ih++) {
    System.out.print("*");
    for(int jh = 1; jh <= 5; jh++) {
        System.out.print("*");
    }
    System.out.print("*");
    for(int jh = 0; jh < 10; jh++) {
        System.out.print("*");
    }
}
```

I. What is output by the following code when it is run?

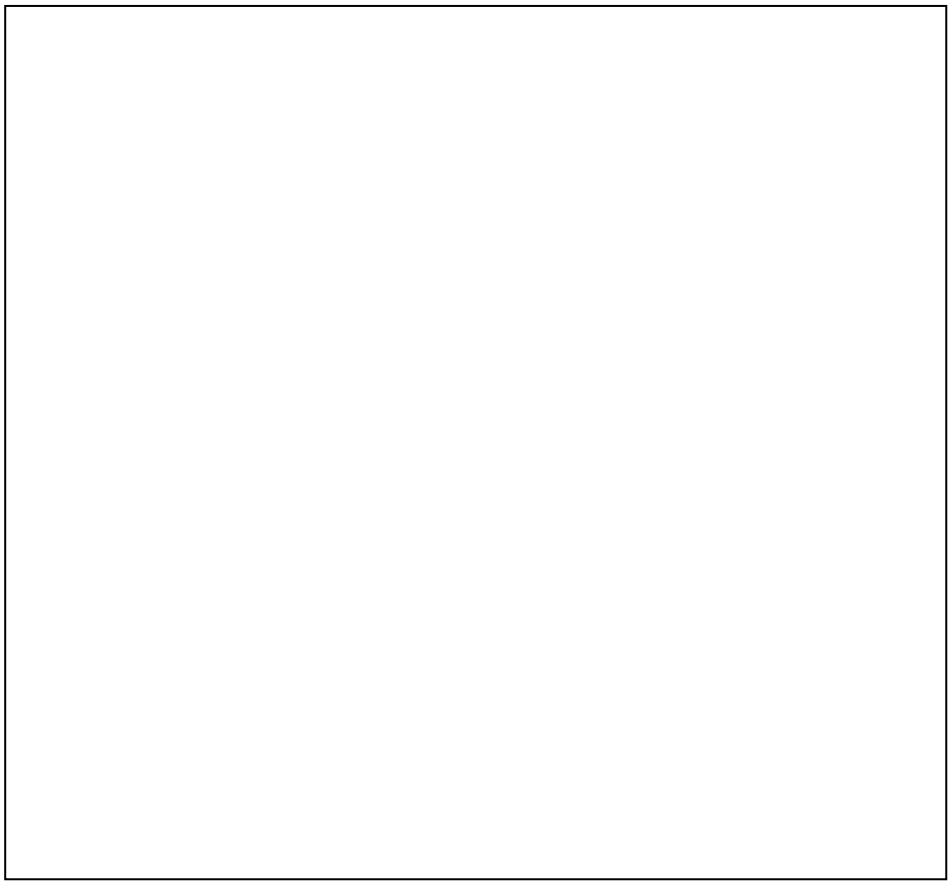
```
int xi = 3;
int yi = 5;
if(xi > yi)
    System.out.print("A");
if(xi * xi > yi)
    System.out.print("B");
else
    System.out.print("C");
if(xi % yi == 0 || yi % xi == 0)
    System.out.print("D");
else
    System.out.print("E");
```

3. Tracing Graphics Programs. 10 points. Sketch the `DrawingPanel` window that is produced when the following program when is run. Do not draw the title bar.

```
import java.awt.Color;
import java.awt.Graphics;

public class Draw {

    public static final int SIZE = 400;

    public static void main() {
        DrawingPanel p = new DrawingPanel(SIZE, SIZE);
        Graphics g = p.getGraphics();
        int part = SIZE / 4;

        // parameters for drawLine are x1, y1, x2, y2, end points of line
        int value = part;
        for(int i = 0; i < 4; i++) {
            g.drawLine(0, 0, SIZE, value);
            g.drawLine(0, 0, value, SIZE);
            value += part;
        }

        // parameters for fillRect are x, y, width, height
        g.setColor(Color.ORANGE);
        g.fillRect(0, 0, part, part);
    }
}
```

Sketch the `DrawingPanel` produced by the program in the box to the right.

Indicate the color with a label if it is not black.



4. Programing and Loops. 20 points. Write a Java method to produce the following output. The output relies on a parameter named `size`.

When the parameter `size` is 3 the output is:

```
**||||
****|||
******||
```

When the parameter `size` is 5 the output is:

```
**||||||
****|||||
******||||
********|||
**********||
```

Complete your method, including the method header, in the space provided:

More room for question 4 on next page.

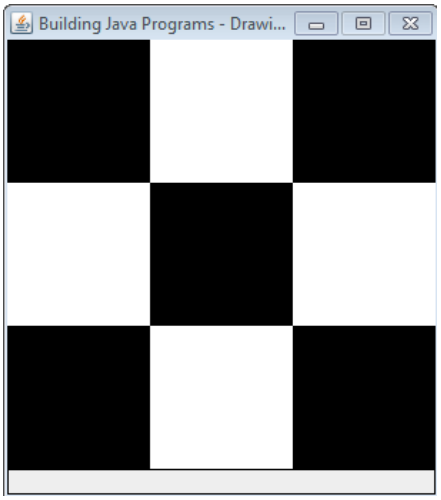
More room for question 4 if necessary.

5. Graphics Programming. 20 Points. Complete a method to produce the following output. The parameters for the method are the `Graphics` object for the `DrawingPanel`, the size of the `DrawingPanel`, and the size of the small squares. Assume the `DrawingPanel` is square with length and width equal to the `size` parameter. Assume that the size of the `DrawingPanel` is a multiple of the small square size. In other words `(DrawingPanel size) % (square size) == 0`.

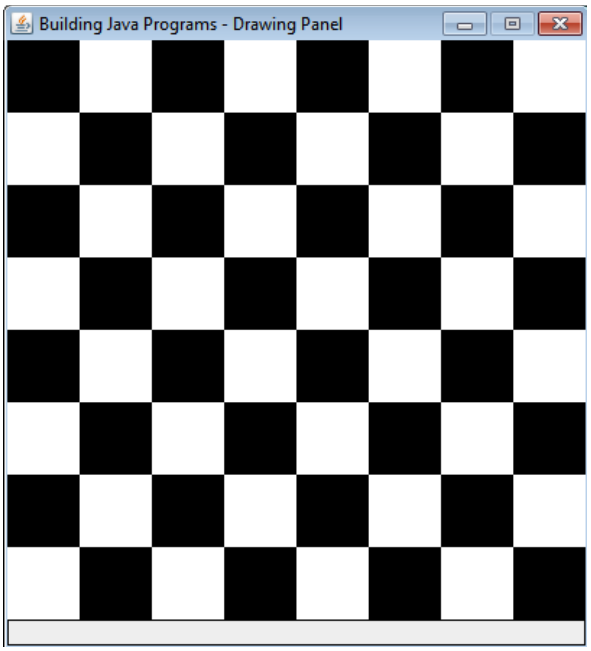
Your method must be general and work for various values of the size of the `DrawingPanel` and various sizes of the smalls squares, assuming the size of the `DrawingPanel` is a multiple of the size of the small square.

Assume the color of the `Graphics` object has already been set to `Color.BLACK`.

Here is the output of the method call `drawBoard(g, 300, 100);`



Here is the output of the method call `drawBoard(g, 400, 50);`



Complete the method on the next page.

Complete the following method:

```
// Assume:
// 1. size is the drawing panel width and height
// 2. size % squareSize == 0

public static void drawBoard(Graphics g, int size, int squareSize) {
```

6. Programming. 15 points. Write a method named `speedingTicket` that determines if a driver will get a speeding ticket from a police officer and if so, the amount of the fine for the ticket.

The method accepts 3 parameters: the speed limit and the speed of the car, in miles per hour. Both of these values are integers. The third parameter is the number of cups of coffee the police officer has consumed this morning, a floating point number.

The police officer will give a ticket to the speeding driver if any of the following conditions are met:

- the police officer has had less than 2.5 cups of coffee and the driver's speed is greater than 5 miles per hour over the speed limit
- the police officer has had 2.5 cups of coffee or more and the driver's speed is greater than 10 miles per hour over the speed limit
- the driver's speed is 100 miles per hour or more regardless the speed limit or the of number of cups of coffee the police officer has had

If the police officer does not give the driver a ticket then they give the driver a warning.

The method prints out if the police officer gives the driver a ticket or a warning. If the driver gets a ticket the method prints out the amount of the fine. The amount of the fine is $50 plus $10 for every mile above the speed limit. If the driver is going twice the speed limit or more the final fine is doubled.

Examples of output from various calls to the `speedingTicket` method. Parameters are the speed limit, the driver's speed, and number of cups of coffee the police officer has had this morning.

```
// parameters are speed limit, actual speed, and cups of coffee
speedingTicket(55, 60, 0.0) output warning
speedingTicket(55, 61, 0.0) output ticket! fine = $110
speedingTicket(55, 60, 2.5) output warning
speedingTicket(55, 61, 2.5) output warning
speedingTicket(55, 61, 5.0) output warning
speedingTicket(25, 49, 0.0) output ticket! fine = $290
speedingTicket(25, 50, 0.0) output ticket! fine = $600
speedingTicket(25, 51, 3.5) output ticket! fine = $620
speedingTicket(25, 51, 0.0) output ticket! fine = $620
speedingTicket(98, 100, 3.5) output ticket! fine = $70
speedingTicket(98, 100, 0.0) output ticket! fine = $70
speedingTicket(75, 100, 3.5) output ticket! fine = $300
```

Complete the method, including the method header, on the next page.

Complete your `speedingTicket` method, including the method header, below:

7. Method Tracing and Parameters Simulation. (2 points each)
Consider the following methods that are all part of the same program:

```
public static void a(int x, int y) {
    x++;
    y = y - x + 1;
    System.out.println(x + " " + y);
}

public static int b(int x, int y) {
    x = x * 2;
    y = y / 2;
    return x + y;
}

public static void c(int x, int y) {
    x += 2;
    y -= 2;
    System.out.println(x + " " + y);
    a(x, y);
}

public static int d(int k) {
    k *= 2;
    System.out.print(k + " ");
    return k;
}
```

A. Given the methods above, what is output by the following code?

```
int xa = 3;
int ya = 8;
a(xa, ya);
System.out.println(xa + " " + ya);
```

B. Given the methods above, what is output by the following code?

```
int xb = 5;
int yb = -4;
xb = b(yb, xb);
System.out.println(xb + " " + yb);
```

C. Given the methods above, what is output by the following code?

```
int xc = 2;
int yc = 3;
b(xc, yc);
System.out.println(xc + " " + yc);
```

D. Given the methods on the previous page, what is output by the following code?

```
int xd = -2;
int yd = 2;
c(xd, yd);
System.out.println(xd + " " + yd);
```

E. Given the methods on the previous page, what is output by the following code?

```
int xe = 5;
xe = d(xe) + 2;
System.out.println(xe + d(xe));
```

8. Programming. 10 points. Write a method that determines the sums of the volumes of a cube and a sphere based on two parameters: the side length of the cube and the diameter of the sphere.

Recall the volume of a cube = $(length\ of\ a\ side)^3$ and the volume of a sphere $= \frac{4}{3}\pi r^3$

The method takes two parameters, the length of a side of the cube and the diameter of the sphere.

For example given a side length of 3 and a diameter of 6 the method would return 140.09733552923257. Given a side length of 1 and a diameter of 2 the method would return 5.1887902047863905.

Write the entire method, including the method header with parameters in the space provided. You may assume the side length of the cube and diameter of the sphere are both greater than or equal to 0. Use the `Math.PI` constant for the value of π.