Section Handout #3
Parameters, Random Numbers, and Simple Graphics

1. True/False questions

For each of the following statements below, indicate whether it is true or false in Java:

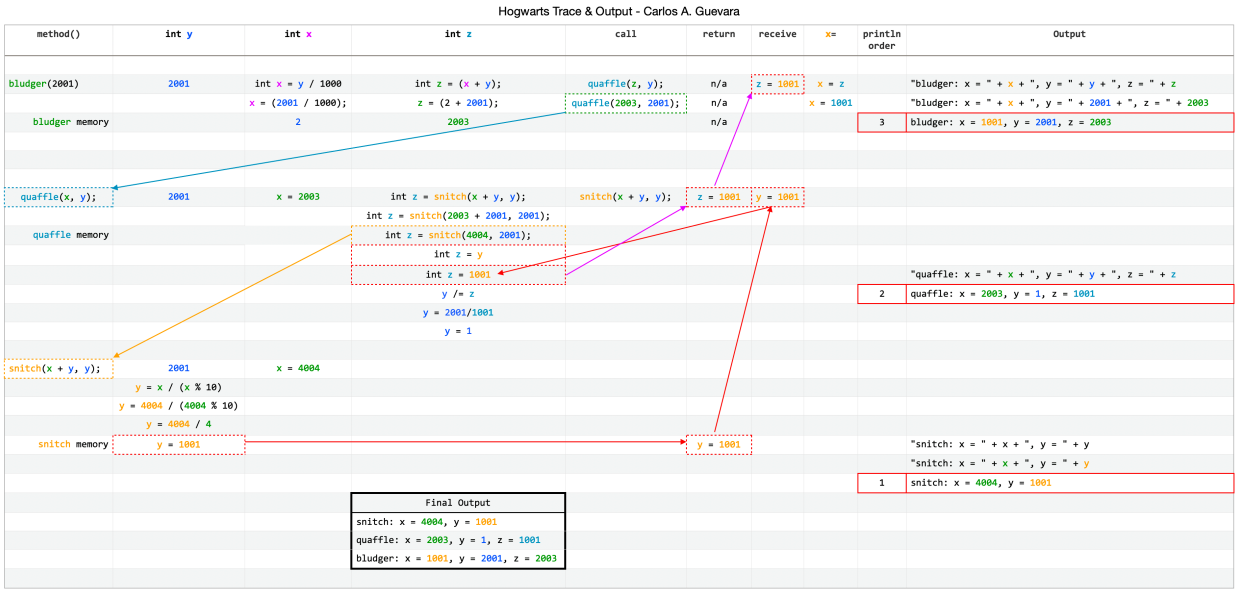
a) The value of a local variable named `i` has no direct relationship with that of a variable named `i` in its caller. **TRUE**

b) The value of a parameter named x has no direct relationship with that of a variable named x in its caller. **TRUE**

2. Tracing method execution

(The following PDF file stored in remote repository proj_assigns/assignment3)

For the program below, trace through its execution by hand to show what output is produced when it runs.



3. **Random circles**
(Code uploaded to remote repository: proj_assigns/assignment3)

Write a GraphicsProgram that draws a set of ten circles with different sizes, positions, and colors. Each circle should have a randomly chosen color, a randomly chosen radius between 5 and 50 pixels, and a randomly chosen position on the canvas, subject to the condition that the entire circle must fit inside the canvas without extending past the edge.

On some runs of this program you might not see ten circles. Why?
The RandomGenerator may select WHITE as a color and it will blend in with the background, rendering it invisible. Another possibility is that one circle may be drawn on top of another circle either covering it up or blending in with the same color.

```
/*
 * File: RandomCircles.java
 * ------------------------
 * This program draws a set of 10 circles with different sizes,
 * positions, and colors. Each circle has a randomly chosen
 * color, a randomly chosen radius between 5 and 50 pixels,
 * and a randomly chosen position on the canvas, subject to
 * the condition that the entire circle must fit inside the
 * canvas without extending past the edge.
 *
 * acm.util.* pkg: https://cs.stanford.edu/people/eroberts/jtf/rationale/UtilPackage.html
*/
import acm.program.*;
import acm.graphics.*;
import acm.util.*;
import java.awt.*;

public class RandomCirclesFinal extends GraphicsProgram {
	private static final double TOTAL_CIRCLES = 10;
	private static final double MIN_RADIUS = 5;
	private static final double MAX_RADIUS = 50;

	private RandomGenerator randgen = RandomGenerator.getInstance();

	public void run() {
	/*
	 * (x, y) = coordinates for GOval
	 * (r, r) = radius of a circle
	 */
		for (int i = 1; i <= TOTAL_CIRCLES; i++) {
			double r = randgen.nextDouble(MIN_RADIUS, MAX_RADIUS);
			double x = randgen.nextDouble(0, getWidth() - 2 * r);
			double y = randgen.nextDouble(0, getHeight() - 2 * r);

			GOval circle = new GOval(x, y, 2 * r, 2 * r);

			circle.setFilled(true);
			circle.setColor(randgen.nextColor());
			add(circle);
		}
	}
}
```

4. **Drawing lines**
(Code uploaded to remote repository: proj_assigns/assignment3)

Write a GraphicsProgram that allows the user to draw lines on the canvas. Pressing the mouse button sets the starting point for the line. Dragging the mouse moves the other endpoint around as the drag proceeds. Releasing the mouse fixes the line in its current position and gets ready to start a new line. Although this program may seem quite powerful, it is also simple to implement. The entire program requires fewer than 20 lines of code.

```
/*
 * File: DrawingLinesFinal.java
 * ----------------------------
 * Assignment: Write a GraphicsProgram that allows the user to draw lines on the canvas.
 * Pressing the mouse button sets the starting point for the line. Dragging the mouse
 * moves the other endpoint around as the drag proceeds. Releasing the mouse fixes the
 * line in its current position and gets ready to start a new line.
 *
 * Because the original point and the mouse position appear to be joined by some elastic
 * string, this technique is called rubber-banding.
 */

import acm.graphics.*;
import acm.program.*;
import java.awt.event.*;

/*
 * The DrawingLinesFinal class allows users to draw lines on the canvas. Lines appear in
 * rubberband style until mouse is released and the line is fixed at the ending position.
 *
 */

public class DrawingLinesFinal extends GraphicsProgram {

	public void run() {
		addMouseListeners();
	}

/* Call on mousePressed sets the starting point (sp) for a new line */
	public void mousePressed(MouseEvent sp) {
		double x = sp.getX();
		double y = sp.getY();
		line = new GLine(x, y, x, y);
		add(line);
	}

/* Call on mouseDragged allows for rubber banding effect and sets the ending point (ep) when
released */
	public void mouseDragged(MouseEvent ep) {
		double x = ep.getX();
		double y = ep.getY();
		line.setEndPoint(x, y);
	}

/* Private instance variables */
	private GLine line;
}
```