CS110 Introduction to Computing
Spring 2011
Exam 1

This is a closed book/ closed notes exam. Your work on this exam must be your own. Answer all questions in the space provided, continuing your answer on the back of the page if necessary. If you want scrap paper, please ask your instructor.

All Processing statements you write should be syntactically correct. There will be no credit for incorrect use of Processing syntax.

Be certain to use proper indentation and commenting in any code you write.

Be certain to sign the log-in sheet for the examination period, and the statement of academic honesty on the exam cover page.

I wish you each the best of luck!

Sign the following statement **after** you have completed the examination. Your exam will **not be graded** without your signature.

For Instructor Use Only:

Question #	Points	Maximum Points
1.		10
2.		10
3.		15
4.		15
5.		10
6.		10
7.		15
8.		20
Total		**100**

Section 1: Basics (10 points total)   Circle or write the correct answer to each question.

1.1 (2 pts) Write your name on EVERY page of the exam booklet and any scrap paper you use.

1.2 (2 pts) What would Processing do as a result of this command? **(B)**

```
line(width, 0, 0, height);
```

A. Draw a line from the lower right corner to the upper left corner of the window
B. Draw a line from the upper right corner to the lower left corner of the window
C. Draw a horizontal line through the center of the window
D. Draw a vertical line through the center of the window

1.3 (2pts) What would Processing draw as a result of this command? **(A)**

```
ellipse(10, 10, 50, 40);
```

A. An ellipse that is wider than it is tall.
B. An ellipse that is taller than it is wide.
C. A perfect circle with diameter 10.
D. A perfect circle with radius 10.

1.4 (2 pts) How many times would this code print the text "Hello World"? **(B)**

```
for (int i=0; i<10; i+=2) {
   println("Hello World");
}
```

A. Ten (10)
B. Five (5)
C. Six (6)
D. None, this is invalid Processing code.

1.5 (2 pts) What value is printed as a result of the following code? **(B)**

```
int z = 5 / 2;
println(z);
```

A. 5
B. 2
C. 2.5
D. None, this code will result in an error.

Section 2: Operators and Expressions (10 points total)
What is the value of x after the following statements are evaluated?

2.1 (2 pts)
```
int x = 3;
x++;
```

4

2.2 (2 pts)
```
float x = 3;
x -= 2;
```

1

2.3 (2 pts)
```
int x = 11;
x = x % 5;
```

1

2.4 (2 pts)
```
float y = 10.5;
boolean x = (y > 9);
```

true

2.5 (2 pts)
```
int y = 0;
boolean x = (y > 0 || y < 0);
```

false

Section 3: Conditionals (15 pts total)

3.1 (7 pts) Write a conditional expression that would print to the screen "weekday" whenever the integer variable `day` is not equal to 0 or 6.

```
if (day != 0 && day != 6) {
     println("weekday");
}
```

3.2 (8 pts) Consider a function which toggles (i.e., switches) the value for a global boolean variable that tracks whether a light is on or off. Two people, creatively named A and B, who are claiming to be expert light switchers have written two different implementations of this function, shown below:

```
// the global variable              // the global variable
boolean lightOn = false;            boolean lightOn = false;
...                                 ...
void toggleLightA() {               void toggleLightB() {
    if (lightOn) {                      if (lightOn) {
        lightOn = false;                    lightOn = false;
    } else {                            }
        lightOn = true;                 if (!lightOn){
    }                                       lightOn = true;
}                                       }
                                    }
```

Are these two implementations equivalent? Are both of the people expert light switchers, or are one or both of them frauds? Why? Explain your answer!

They are not equivalent. Person A is an expert. Person B is a fraud. The function toggleLightB() is implemented with two consecutive if-statements that set lightOn to false and then back to true whenever lightOn starts with a value of true. Consequently, the value of lightOn does not toggle between true and false.

Section 4: Loops (15 pts total)

4.1 (10 pts)   Rewrite the following code, using a `while` loop instead of a `for` loop. The results the two code fragments should be identical.

```
int num = 65;
for (int i=0; i < 4; i++) {
     println(num);
     num = num / 2;
}
println(num);

int num = 65;
int i = 0;

while ( i < 4 ) {
     println(num);
     num = num / 2;
     i++;
}
println(num);
```

4.2 (5pts) What will be printed by the code fragment in the above question 4.1?

65
32
16
8
4

5. Functions (10 pts) Consider the following code. When this program runs, what will be printed?

```
float x = 10.0;

void setup() {
    test();
    println(x);
}

void draw() { }

void test() {
    float x = 20.0;
    println(x);
}

20.0
10.0
```

6. Arrays (10 pts) Complete the following function. Be sure to comment your code!

```
/** Prints all the values of the array, one per line
 * @param vals - the array to print
 */
void printArray(float[] vals) {

    // Your code goes here


    for (int i=0; i<vals.length; i++) {
        println( vals[i] );
    }




    }  // closing brace for printArray()
```

7: Random Numbers and Debugging (15 pts)

The following program is supposed to draw a red ball at a random location such that the *entire* ball appears on the screen. Instead, sometimes it is drawing the ball so that part of it is off the screen. Show how you can fix this program. Explain your answer!

```
float x;
float y;
int ballDiameter = 10;

void setup() {
    size(500, 500);
    // choose the ball's x and y position randomly
    float hdiam = ballDiameter / 2;
    x = random(hdiam, width-hdiam);
    y = random(hdiam, height-hdiam);
}

void draw() {
    // draw the ball at the specified location
    fill(255, 0, 0);
    ellipseMode(CENTER);
    ellipse(x, y, ballDiameter, ballDiameter);
}
```

By limiting the x and y values to ranges that are reduced by half the diameter of the ball, we can always guarantee that the ball will not be drawn with any part off the screen.

8: Classes (20 pts)

Write a class called Box that has two float fields named x, y that represent the Box's location (x,y), and two integer fields named w, and h that represent the Box's width (w), and its height (h). The Box constructor should initialize these fields using four arguments passed into it. The Box class has one method called display() that draws the Box at its location. A start of the class has already been defined for you, along with a program to use the Box class. You may use the back of the page if necessary.

```
Box myBox;

void setup() {
    size(500, 500);
    myBox = new Box(random(width), random(height), 40, 30);
}

void draw() {
    myBox.display();
}

class Box {
  // your implementation goes here!!


  float x;
  float y;
  int w;
  int h;

  Box(float tx, float ty, int tw, int th) {
    x = tx;
    y = ty;
    w = tw;
    h = th;
  }

  void display() {
    rect(x, y, w, h);
  }




  }  // closing brace for the Box class
```