CS 101 Spring 2006 Midterm 2 Name: _____ Email ID: _____

This exam is open text book but closed-notes, closed-calculator, closed-neighbor, etc. Questions are worth different amounts, so be sure to look over all the questions and plan your time accordingly. Please sign the honor pledge here:

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Note: When an integer type is required use `int`*, when a floating-point type is required use* `double`*.*

1. (3 points) What section are you in?

____ CS 101-E

____ CS 101-3 (lab 8-9:15AM Thu)

____ CS 101-4 (lab 9:30-10:45 AM Thu)

____ CS 101-5 (lab 11-12:15 AM Thu)

____ CS 101-6 (lab 12:30-1:45 PM Thu)

____ CS 101-7 (lab 2-3:15 PM Thu)

____ CS 101-8 (lab 3:30-4:45 PM Thu)

____ CS 101-9 (lab 5-6:15 PM Thu)

____ CS 101-10 (lab 6:30-7:45 PM Thu)

____ CS 101-11 (lab 8-9:15 PM Thu)

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Part I: Pre-Chapter 4

1. (4 points) Evaluate the following expressions and give the value:

   a. `! false || true && ! true` _____

   b. `(6 == 15) ? 45 : 56` _____

   c. `(false) ? true : false` _____

   d. `!(false && true) == (! false) || (! true)` _____

2. (4 points) Given two `int` variables, *firstPlaceScore* and *secondPlaceScore*, that are already declared and initialized, write the necessary Java code that swaps their values. You may declare any additional variables as necessary.

3. (4 points) Given two `int` variables *distance* and *speed*, write an expression in Java that divides *distance* by *speed* using floating point arithmetic (i.e., a floating point result should be produced).

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4. (6 points) Suppose there is a class *AirConditioner*. The class supports the following behaviors: turning the air conditioner on, off, and setting the desired temperature. The following methods are provided for these behaviors: *turnOn()* and *turnOff()*, which accept no arguments and return no value, and *setTemp()*, which accepts an *int* argument and returns no value. There is a reference variable *officeAC* of type *AirConditioner*. Create a new object of type *AirConditioner* called *officeAC*. After that, turn the *officeAC* air conditioner on, and set the desired temperature to 68 degrees.

Part II: Chapter 5 (Decisions)

5. (3 points) Given the `int` variables *yearsWithCompany* and *department*, write an expression in Java that evaluates to `true` if and only if *yearsWithCompany* is less than 5 and *department* is not equal to 99.

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6. (5 points) Write a if/else statement that multiplies the `double` variable *pay* by one-and-one-half if the variable of the `boolean` variable *workedOvertime* is `true`.

7. (6 points) Write an if/else statement that adds 1 to the variable *minors* if the variable *age* is less than 18, adds 1 to the variable *adults* if *age* is 18 through 64, and adds 1 to the variable *seniors* if *age* is 65 or older. (Note: you are not allowed to use a `switch` statement). All variables are of type `int`.

8. (9 points) Write a `switch` statement that tests the value of the `char` variable *response* and performs the following actions:
    a. If *response* is 'y', the message "Your request is being processed" is printed
    b. If *response* is 'n', the message "Thank you anyway for your consideration" is printed
    c. For any other value of *response*, the message "Invalid entry; please try again" is printed

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9. (9 points; 3 points each) Consider the following if statement. Assume that `int` variables *v1*, *v2*, and *v3* have already been defined and initialized.

```
if ( v1 <= v2) {
   if ( v1 <= v3 ) {
        System.out.println("A”);
   }
   else {
        System.out.println("B”);
   }
}
else if ( v2 <= v3 ) {
   System.out.println("C”);
}
else {
   System.out.println("D”);
}
```

A. What is printed if variables *v1*, *v2*, and *v3* all have the value 1?

B. What is printed if variable *v1* has value 2, *v2* has value 0, and *v3* has value 1?

C. What is printed if variable *v1* has value 2, *v2* has value 3, and *v3* has value 2?

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Part III: Chapter 6 (Iteration)

10. (5 points) Convert the following code to use a `while` loop instead of a `for` loop. Assume that *k* has already been declared.

```
for ( k=0; k < 97; ++k ) {
   System.out.print("*");
}
```

11. (6 points) Given an `int` variable *n* that has already been declared and initialized to a positive value, write a `while` loop to print a single line consisting of *n* asterisks. For full credit, you must use no variables other than *n*.

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12. (6 points) What is the output of the following code when it executes?

```
for (int i = 0; i < 8; ++i) {
     if (i % 2 == 1) {
          continue;
     }
     for (int j = 0; j < i; ++j) {
          System.out.println(i + " " + j);
     }
}
```

Part IV: Chapter 4 (Classes)

13. (5 points) Write a definition of a class *Clock*. The class has no constructors and three instance variables. One is of type `int` called *hours*, initialized to 12, and another is of type `boolean` called *isTicking*, initialized to `true`, and the last one is of type `int` called *diff*, initialized to 5. All instance variables should be private.

14. (5 points) Write a constructor for the class in the previous question -- the constructor should take 3 parameters, an `int`, a `boolean`, and another `int`. The constructor should set the instance variables to the values provided.

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Part V: Programming

15. (20 points) A "right triangle" is a triangle with an angle of 90^o. Write a complete Java program that computes and prints the length of all 3 sides of all right triangles up to a user specified side length. So if the user enters 15, the program will print out all right triangles with all sides less than length 15 (we are only dealing with integer length sides here). The program should contain three loops in a fully-nested structure. It is okay to print duplicates, such as (5,12,13) and (12,5,13). Remember, for a right triangle, by definition the square of one side plus the square of the other side equals the square of the hypotenuse (i.e., $a^2 + b^2 = c^2$). A sample execution run is as follows ('15' was entered by the user).

```
Enter max side length: 15
(3, 4, 5)
(4, 3, 5)
(5, 12, 13)
(6, 8, 10)
(8, 6, 10)
(12, 5, 13)
```

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