CIS*2430 (Fall 2009) Miterm Exam One Solutions

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Part I: Multiple Choice (4 marks each): circle the choice for the right answer.

1. The behaviour of an object is defined by its
   (a) methods
   (b) constructor
   (c) instance data
   (d) all of the above

2. An object-oriented programming language
   (a) uses structured programming
   (b) views a program as consisting of objects which communicate through interactions
   (c) functionally breaks a problem down into smaller, more manageable problems
   (d) formulates a set of rules about different conditions
   (e) All of the above

3. The hardest kind of error to detect in a computer program is
   (a) Syntax error
   (b) Run-time error
   (c) Logic error
   (d) Compilation error

4. The relationship between a class and an object is best described as
   (a) objects are instances of classes
   (b) objects are the instance data of classes
   (c) classes are instances of objects
   (d) objects and classes are the same thing

5. A variable declared within a method is known as a
   (a) public instance variable
   (b) parameter
   (c) local variable
   (d) private instance variable

6. The most appropriate syntax for a Java named constant SALES_TAX is
   (a) public double SALES_TAX = 7.50;
   (b) public static double SALES_TAX = 7.50;
   (c) public static final double SALES_TAX = 7.50;
   (d) private static final double SALES_TAX = 7.50;

7. In Java, overloading means that
   (a) Two methods have the same name

(b) Two methods have the same name, but different signatures for the parameters.
(c) Two methods have the same name, but different signatures and/or return types.
(d) Same as (b) above, but only for public methods

8. A valid argument to the System.out object's println method is
   (a) "Anything with double quotes"
   (b) A variable of type int
   (c) A concatenation of multiple strings
   (d) All of the above

9. The new operator
   (a) allocates memory
   (b) is used to create an object of a class
   (c) is used with a constructor
   (d) All of the above

10. If two variables contain references to the same object then
    (a) The object may be modified using either reference
    (b) The object cannot be modified unless there is only one reference to it
    (c) A third reference is created if/when the object is modified
    (d) None of the above

11. Consider the following two lines of code. What can you say about s1 and s2?

```
String s1 = "testing" + "123";
String s2 = new String("testing123");
```

    (a) s1 and s2 are the references to the same String object
    (b) the line declaring s2 is legal in Java, but the line declaring s1 will produce a syntax error
    (c) s1 and s2 are both references to different String objects
    (d) none of the above

12. The keyword `this` refers to
    (a) an instance variable
    (b) a local variable
    (c) a public variable
    (d) a calling object itself

Part II. Short Answer Questions (6 marks each)

13. What are the three major roles of a compiler? What kind of bugs can be detected by a compiler? What kind of bugs cannot be detected by a compiler? What is the main advantage of generating byte-code for Java compiler?

    Roles of a complier: validator, translator, and optimizer

A compiler can detect syntactic errors, but not runtime and logic errors.
Main advantage of generating byte-code: portable (compile once and execute everywhere)

14. In the following code fragment, square brackets [] appear three times. Briefly explain the meanings of each occurrence of the square brackets.

```
double[] scores = new double[10];
for( int i = 0; i < scores.length; i++ )
    scores[i] = i * 10.0;
```

(1) double[] denotes to a data type
(2) double[10] specifies the range of an array and allocates memory for it
(3) scores[i] refers the indexed variables in an array

15. Java has quickly become a popular programming language. List at least four major advantages of this language.

Java is a pure object-oriented programming language.
Java is comprehensive with built-in support for GUI, concurrent, and network programming.
Java is extendable with many predefined packages.
Java is highly portable: compile once and execute everywhere.

16. Java has primitive data types and class data types. List three major differences between these two kinds of data types.

A primitive type has a single element with a fixed memory, while a class type typically has a structure of multiple elements and its memory size is varied depending on its definition.

A variable of a primitive type is associated to its memory directly, while a variable of a class is associated to its memory (allocated through the new operator) indirectly through a reference (memory address).

All primitive types are system-defined and there are only 8 of them in Java, while all class types are user-defined and there can be many of them.

Variables of a primitive type can be compared with the relation operators (such as == and !=),while variables of a class have to be compared with its definition of the “equals” method.

Part III. Code Review Questions (28 marks in total)

17. (6 marks) Analyze the following code fragment, circle any mistake, and tell what will be the output values:

```
public class Test {
  public static void main(String[] args) {
    OtherClass myVariable = new MyVariable();
    System.out.println(myVariable.someMethod(5));
    System.out.println(OtherClass.someMethod("hello");
  }
}

public class OtherClass {
   public int someMethod(int theInt) {
     return (theInt * 3);
   }
   public int someMethod(String theString) {
     return (theString.length());
   }
}
```

Output:

```
15
5
```

18. (6 marks) What is the output of the following Java statements?

```
String str = "Java Programming!";
System.out.println(str.equals("java programming!"));
System.out.println(str.equalsIgnoreCase("java programming!");
System.out.println(str.toLowerCase());
System.out.println(str.substring(5));
```

Output:

```
false
true
java programming!
Programming!
```

19. (8 marks) Suppose that you have defined a class like the following for use in a program:

```
public class YourClass {
  private int information;
  private char moreInformation;

  public YourClass(int newInfo, char moreNewInfo) {
    // details not shown
  }

   public YourClass() {
     // details not shown
   }

   public void doStuff() {
     // details not shown
   }
```

```
}
```

Underline the statements in the following fragment that are not legal or will cause exceptions in Java.

```
YourClass anObject = new YourClass(42, 'A');
YourClass anotherObject = new YourClass(41.99, 'A');
YourClass yetAnotherObject = new YourClass();
yetAnotherObject.doStuff();
YourClass oneMoreObject;
oneMoreObject.doStuff();
oneMoreObject = YourClass(99, 'B');
```

20. (8 marks) Consider the following class definition:

```
public class Bill {
   public static double RATE = 150.0;
   private int hours;
   private int minutes;
   private double fee;

   public void inputTimeWorked() {
     . . .
   }

   private double computeFee(int hoursWorked, int minutesWorked) {
     minutesWorked = hoursWorked * 60 + minutesWorked;
     int quarterHours = minutesWorked / 60;
     return quarterHours * RATE;
   }

   public void updateFee() {
      fee = computeFee(hours, minutes);
   }

   public void outputBill() {
      . . .
   }

   public static void main(String[] args) {
      Bill yourBill = new Bill();
      yourBill.inputTimeWorked();
      yourBill.updateFee();
      yourBill.outputBill();
   }
}
```

For each of the following structures that create their own scopes, identify which members are visible from within and which members are visible from outside. By visible, we mean that you can use these members from within the given scope. Note that a member can be either a variable or a method.

(a) An instance or object of the *Bill* class:

Within: hours, minutes, fee, inputTimeWorked, computeFee, updateFee, and outputBill
Outside: RATE and main

(b) Within the *computeFee* method:

Within: hoursWorked, minutesWorked, and quarterHours
Outside: hours, minutes, fee, inputTimeWorked, computeFee, updateFee, outputBill, RATE, and main.

(c) Within the *main* method:

Within: yourBill
Outside: RATE