COP 3804
Intermediate Java Programming

Examination 2

Name: ________________________________

SAMPLE

This exam has 3 additional pages with 3 questions.
1. [35 pts] Consider the following code:

```java
class A {
    abstract public String foo();
}

class B extends A {
    public B() {
        this("" );
    }
    public B(String bm) {
        bmsg = bm;
    }

    public String foo() {
        return bmsg;
    }

    private String bmsg;
}

class C extends B {
    public C(String bm, String cm) {
        super(bm);
        cmsg = cm;
    }
    public C() {
        this("", "");
    }

    public String foo() {
        return cmsg + super.foo();
    }

    private String cmsg;
}
```

(a) The compiler is complaining about the implementation of class A. What is the problem and the fix?

(b) Assuming class A is repaired, which of the following lines of code are legal?

```java
A obj = new A();
A obj = new B();
A obj = new C();
B obj = new C();
C obj = new B();
```

(c) What is the output of the following code?

```java
A[] items = { new B("foo"), new C("foo", "bar")};
System.out.println(items[0].foo() + items[1].foo());
```
2. [25 pts] Answer each part TRUE or FALSE

(a) All methods in an abstract class must be abstract.
(b) An abstract class may provide constructors.
(c) An abstract class can declare instance data.
(d) An abstract class can extend another abstract class.
(e) An abstract class can extend a non-abstract class.
(f) A subclass may access private data in the superclass.
(g) When a method is overridden, additional exceptions can be added to the throws list.
(h) A public method can only be overridden with another public method.
(i) A class may extend more than one class.
(j) Object is an abstract class.
3. [40 pts] Consider the following four classes: WalkupTicket, AdvanceTicket, StudentAdvanceTicket, and Ticket, which interact as follows:

- A WalkupTicket has a seat number and price method that returns a double, but I am not telling you the exact price because you do not have to implement WalkupTicket on this exam.
- An AdvanceTicket has a seat number and a price method that returns a double, but I am not telling you what the double is because you do not have to implement AdvanceTicket on this exam.
- A StudentAdvanceTicket IS-A AdvanceTicket. If the AdvanceTicket’s price method returns $d$, then the StudentAdvanced’s price method returns $d/2$. Needless to say, if the AdvanceTicket’s price method changes to return a different price, then the StudentAdvanced’s price method will automatically be aware of this.
- A Ticket has a seat number. Also, a WalkupTicket IS-A Ticket and an AdvanceTicket IS-A Ticket. Tickets are not intended to be constructed directly by the client (but of course, a Ticket still has a constructor).

For this question, do the following (You do not have to provide any functionality beyond the specifications above.):

(a) The four classes above form an inheritance hierarchy. Draw the hierarchy.
(b) Implement Ticket.
(c) Implement StudentAdvanceTicket.
(d) Implement the following method:

```java
// Return total price of all tickets
public static double totalPrice(ArrayList<Ticket> arr)
{
```
