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:

```
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?

```
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?

```
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`. `Ticket`s 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:

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