Write the answers to question 1 on this sheet. Write the other answers in the exam booklet. Give short answers where possible.

1. True/False. Please circle the correct answer on this sheet.
   (a) T F A static method cannot access non-static members of the “this” object.
   (b) T F All types in Java are extended, either directly or indirectly, from Object.
   (c) T F If B is a subclass of A, then a cast can be used to transform an object of class A into an object of class B.
   (d) T F The syntax of the C programming language was copied from Java, which is why there are many syntactic similarities.
   (e) T F The creation of a thread object causes its run() method to start executing.
   (f) T F If a constructor that takes one or more parameters is defined for a class, then no nullary (i.e. parameterless) constructor is automatically defined for that class.
   (g) T F Putting a “return” statement in an exception handler causes the program to resume executing at the point in the program where the exception was raised.
   (h) T F Given a class with several static synchronized methods, only one of these methods can be executing at a time.
   (i) T F Given an abstract class A, the statement “A x = new A();” will cause an exception to be raised during execution.
   (j) T F Given a class A with a private member x, and given a class B extended from A, an object of class B will contain an x field even though it is not visible to the methods defined inside B.

2. (a) A variable of a subclass cannot point to an object of the parent class. Give an example showing why allowing this would be unsafe in Java.
   (b) If a programmer is not careful, he or she might accidentally implement static overloading when overriding (aka dynamic overloading) was intended. Give an example that illustrates this situation.
   (c) When is the use of the “this” keyword necessary? Give an example.

3. (a) What is an interface in Java?
   (b) Given the code
       ```java
       void f(A x) {
           ...
       }
       ```
       one cannot tell whether A is an interface or a class.
       i. If possible, write a single statement to replace the “...” which would only be valid if A were a class and not an interface.
       ii. If possible, write a single statement to replace the “...” which would only be valid if A were an interface and not a class.
   (c) In your third programming assignment, you had to write a bubblesort procedure that operated on an array of Sortable elements. Why was Sortable declared as an interface rather than as a class?
4. What does this program print?

```java
class test {
    static int foo(int x) {
        try{
            if(x==0)
                throw new Exception();
            else {
                System.out.println("30/x = " + 30/x);
                return 30/x;
            }
        }
        catch (Exception e) { System.out.println("Error");
            return 30;
        }
        finally { System.out.println("This exam is easy"); }
    }
    public static void main(String args[]) {
        System.out.println(foo(10));
        System.out.println(foo(0));
    }
}
```

5. I wrote the following code to have three threads cooperate to print the numbers between zero and 999.

```java
class myRun implements Runnable {
    int thisId;
    static int count = 0;
    myRun(int id) {
        thisId = id;
    }
    public void run() {
        System.out.println("My priority is " + this.getPriority());
        while (count < 1000) {
            System.out.println(thisId + ": " + count);
            count = count + 1;
        }
    }
}
class Prog {
    public static void main(String args[]) {
        for(int i=0; i<3;i++)
            new Thread(new myRun(i)).start();
    }
}
```

(a) There are significant errors in the program (there are no mispellings, though). What are the errors? Don’t list more than three.

(b) Fix the errors, by inserting some code in the appropriate places. Feel free to write on this paper so that you don’t have to copy over any of the code I’ve written.