PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Department of Computer Engineering

Final Examination: Semester 2   **Academic Year**: 2007-2008

Date: 21st February, 2008   **Time**: 13:30 – 16:30 (**3 hours**)

Subject Number: 240-321 **and** 241-211   **Room**: A201

Subject Title: Advanced Computer Programming Techniques
          and   Object Oriented Programming

Lecturer: Aj. Andrew Davison

Exam Duration: 3 hours

This paper has 3 pages.

Authorised Materials:

- Writing instruments (e.g. pens, pencils).
- Books (e.g. dictionaries) and calculators are **not** permitted.

Instructions to Students:

- *Answer questions in English.* Perfect English is **not** required.
- Attempt all questions.
- Write your answers in an answer book.
- Start your answer to each question on a new page
- Clearly number your answers.
- Any unreadable parts will be considered wrong.
- When writing programs, use good layout, and short comments;
  marks will not be deducted for minor syntax errors.
- The marks for each part of a question are given in brackets (…).

Question 1   (30 marks; 30 minutes)

a)   What does a subclass inherit from its superclass? (5)

b)   What are the uses of the `super` reserved word? (5)

c)   What is a *polymorphic* data structure? (20)

Each answer should include diagrams and **small** code fragments where possible.

Question 2   (30 marks; 30 minutes)

What are the *three* main uses of the `interface` type?

Your answer should include diagrams and **small** code fragments where possible.

Question 3   (20 marks; 20 minutes)

The following abstract class defines a shape:

```
public abstract class Shape
{
  private Point position;

  public Shape()
  { position = new Point(0,0); }

  public Shape(Point p)
  { position = p; }

  public Point getPosition()
  { return position; }

  public abstract double getArea();
}
```

a) Implement a concrete Rectangle class which subclasses Shape. It should include methods to get and set its length and width.   (10)

b) The following Zoomable interface is intended to increase or decrease an object's dimensions (i.e. it's length and width) by the specified factor. If factor is 1.0 then the object is unchanged.

```
public interface Zoomable
{
  public void zoom(double factor);
}
```
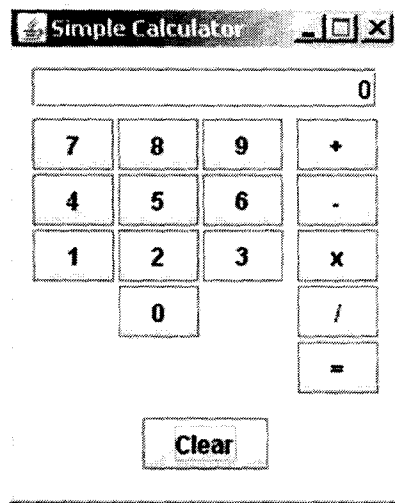
Rewrite the Rectangle class to implement the Zoomable interface. Only show the parts of the class which have changed from part (a).   (10)

Question 4 is on the Next Page.

Question 4   (100 marks; 100 minutes ι

The following Java application is a simple calculator:

a) Implement the GUI using suitable components and layout managers. *Hint*: the five operator buttons are grouped in a separate JPanel from the number buttons.
Hint: a button can be made invisible with the setVisible() method. (50)

b) Implement the listeners. You may assume that the "/" operation is integer division.

   Hint: my solution utilizes three listeners: one for all the number buttons, one for all the operator buttons, and one for the "Clear" button. (50)

--- *End of Examination* ---