Assignment 03

3/10/2010

1. Answer the following questions.
   (From H.M. Deitel and P.J. Deitel, Java How to Program)

   (a) How does inheritance promote software reusability?

   (b) Explain the difference between composition (i.e., the has-a relationship) and inheritance (i.e., the is-a relationship).

   (c) Explain the difference between protected and "default" member access.

   (d) How do you call a relationship where a class object has references to objects of other classes as members.

   (e) Explain how to invoke a superclass method from a subclass method for the case in which the subclass method overrides a superclass method and the case in which the subclass method does not override a superclass method.

2. Exercise 1 - Instruments
   Imagine you are asked to design a program for managing musical instruments. You have a list of some of the instruments that will be in the program, but not all. You know each instrument will be represented by an object, and that objects will be able to perform whatever they are supposed to.
   banjo, cello, clarinet, conga, drums, flute, guitar, harmonica, quena, saxophone, taiko, violin
   And we want other programmers to be able to add new kinds of instruments to the program at any time.
   (You don't need to code anything, instead you can use UML diagrams)

3. Exercise 2 - Shapes

   (a) Create a Shape class. The class has attributes dimension1, dimension2, color, each of which have default values. It has accessor methods. It has member functions that calculate the perimeter and the area, which both print the message: "I don't know how to calculate it". Why would you think is necessary to print such a thing?

   (b) Create a Rectangle class. Attributes defaults to 1. It has member functions that calculate the perimeter and the area of the rectangle. It has accessor methods.

   (c) Create a RigthTriangle class. Attributes defaults to 1. It has member functions that calculate the perimeter and the area of the triangle. It has accessor methods.

   (d) Create a TestShapes class. Create different objects and print their features (Who's responsible for this?)

4. [optional] Write an inheritance hierarchy for classes Quadrilateral, Trapezoid, Parallelogram, Rectangle and Square. Use Quadrilateral as the superclass of the hierarchy. Specify the attributes and methods for each class. The private attributes of Quadrilateral should be the x-y coordinate pairs for the four endpoints of the Quadrilateral. Write a program that instantiates objects of

your classes and outputs each object's area (except Quadrilateral). Hint: Create and use a Point class to represent the corners of the shapes.

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Coordinates of Quadrilateral are:
( 1.1, 1.2 ), ( 6.6, 2.8 ), ( 6.2, 9.9 ), ( 2.2, 7.4 )

Coordinates of Trapezoid are:
( 0.0, 0.0 ), ( 10.0, 0.0 ), ( 8.0, 5.0 ), ( 3.3, 5.0 )
Height is: 5.0
Area is: 36.75

Coordinates of Parallelogram are:
( 5.0, 5.0 ), ( 11.0, 5.0 ), ( 12.0, 20.0 ), ( 6.0, 20.0 )
Width is: 6.0
Height is: 15.0
Area is: 90.0

Coordinates of Rectangle are:
( 17.0, 14.0 ), ( 30.0, 14.0 ), ( 30.0, 28.0 ), ( 17.0, 28.0 )
Width is: 13.0
Height is: 14.0
Area is: 182.0

Coordinates of Square are:
( 4.0, 0.0 ), ( 8.0, 0.0 ), ( 8.0, 4.0 ), ( 4.0, 4.0 )
Side is: 4.0
Area is: 16.0
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