CS2006 C++ Lab Exercises
Week 17

1. Imagine a publishing company that markets both book and tape versions of its works. Create a class publication that stores the title (a string) and price (type float) of a publication. From this class derive two classes book, which adds a page count (type int); and tape, which adds a playing time in minutes (type float). Each of these three classes should have a getdata() function to get its data from the user and a putdata() function to display its data.
   Write a main program to test the book and tape classes by creating instances of them, asking the user to fill in their data with getdata(), and then displaying the data with putdata(). Demonstrate the use of virtual functions.

2. Define a pure abstract base class called BasicShape. The BasicShape class should have the following members:
   Private member variable:
   - Area, a double used to hold the shape's area

   Public member functions:
   - getArea. This function should return the value in the member variable area.
   - calcArea. This function should be a pure virtual function.

   Next, define a class named Circle. It should be derived from the BasicShape class. It should have the following members:
   Private member variables:
   - centerX, a long integer used to hold the x coordinate of the circle's center.
   - centerY, a long integer used to hold the y coordinate of the circle's center.
   - radius, a double used to hold the circle's radius

   Public member functions:
   - Constructor – accepts values for centerX, center, and radius. Should call the overridden calcArea function described below.
   - getCenterX-returns the value in centerX.
   - getCenterY-returns the value in center.
   - calcArea-calculates the area of the circle (area=3.14159 * radius * radius) and stores the result in the inherited member area.

   Next, define a class named Rectangle. It should be derived from the BasicShape class. It should have the following members:
   Private member variables:
   - Width, a long integer used to hold the width of the rectangle.
   - Length, a long integer used to hold the length of the rectangle.

   Public member functions:
   - Constructor-accepts values for width and length. Should call the overridden calcArea function described below.
   - getWidth-returns the vale in width.
   - getLength-returns the value in length.
   - calcArea-calculates the area of the rectangle (area = length * width) and stores the result in the inherited member area.

After you have created these classes, create a driver program that defines a Circle object and a Rectangle object. Demonstrate that each object properly calculates and reports its area.

3. This exercise makes use of classes discussed in the lecture (sample programs).
   In a course, a teacher gives the following tests and assignments:
   - A lab activity that is observed by the teacher and assigned a numeric score
   - A pass/fail exam that has 50 questions. The minimum passing score is 70.
   - An essay that is assigned a numeric score
   - A final exam that has 50 questions.

   Write a class named CourseGrades. The class should have a member named grades that is an array of GradedActivity pointers. The grades array should have four elements, one for each of the assignments previously described. The class should have the following member functions:
   - setLab: This function should accept the address of a GradedActivity object as its argument. This object should already hold the student’s score for the lab activity. Element 0 of the grades array should reference this object.
   - setPassFailExam: This function should accept the address of a PassFailExam object as its argument. This object should already hold the student’s score for the pass/fail exam. Element 1 of the grades array should reference this object.
   - setEssay: This function should accept the address of an Essay object as its argument. This object should already hold the student’s score for the essay. Element 2 of the grades array should reference this object.
   - setPassFailExam: This function should accept the address of a FinalExam object as its argument. This object should already hold the student’s score for the final exam. Element 3 of the grades array should reference this object.
   - Print: This function should display the numeric scores and grades for each element in the grades array.

   Demonstrate the class in a program.