Chapter 5 Laboratory Exercise

Prelab Assignment

1. Write a UML diagram for a class Student containing private instance variables to store the following data: name, gpa, age, and major. Use whatever data types are most appropriate for each instance variable. Include public methods for reading and writing objects of type Student, and a method for retrieving the value stored in each instance variable.

2. Write a Java class definition that implements the class Student.

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1. Complete the definitions for the methods for the class Money shown below. The Money class allows you to do operations on numbers that have exactly two places to the right of the decimal point.

```
class Money {
  private int dollars, cents;

  public void setup (int d, int c) { … }
  public void add (Money m) { … }
  public void subtract (Money m) { … }
  public void multiply (Money m) { … }
  public void divide (Money m) { … }
  public String toSring ( ) { … }
    // returns string of the form $ddd.cc
}
```

2. Write a client program to test the Money class you wrote for exercise 1.

3. Write a Java application that uses your Money class in a simple interest application to do all arithmetic calculations. Each month a bank customer deposits $50 into a savings account. If the annual interest is fixed at 4% and is only calculated quarterly the customer will receive 1% interest every three months (regardless of when deposits are made). Devise a class definition for a SavingsAccount object and draw a UML diagram. Write a Java program that will calculate and display the monthly account balances for 24 months of deposit activity, with 3 different annual interest rates. Your output tables should be formatted as follows:

```
           Total       4%     Account
Month     Deposits  Interest  Balance
  1         50.00     0.00      50.00
  2        100.00     0.00     100.00
  3        150.00     1.50     151.50
  4        200.00     0.00     201.50
  5        250.00     0.00     251.50
  6        300.00     3.02     304.52
  7        350.00     0.00     354.52
```

4. Rewrite your solution exercise 3 to allow for the comparison of interest calculated monthly (one-twelfth of the annual rate) with interest calculated quarterly.

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Postlab Questions

1. How could you prevent the Money class from storing more than two digits to the right of the decimal point if a client passes too many digits to the constructor?

2. What other methods would be helpful to include in the Money class?

3. Did you find it easy to use the Money instance variables to store the results of the arithmetic operations? Explain.

4. Did you have any problems determining the scope of the variables used in the Money class methods? Explain.