

## Object Oriented Design and Programming

### Tutorial

### Bank Accounts

Consider the following simplified description of bank accounts:

- \* Banks hold accounts owned by people. A bank has a name and a daily interest rate. Daily interest rates may change.
- \* A person has a name, and may own more than one account. Every person has an overdraft limit, which sets a limit to the amount this person may be overdrawn on any of his/her accounts. Note that the overdraft limit does not depend on banks or accounts.
- \* Money may be paid into or withdrawn from an account.
- \* When an amount is paid into an account on a given date, then interest is calculated as the product of the number of days from the last transaction until the current transaction, the interest rate of the holding bank, and the balance. Then, the interest and the amount are added to the balance.
- \* When an amount is withdrawn from an account on a given date, then interest is calculated as the product of the number of days from the last transaction until the current transaction, the interest rate of the holding bank, and the balance. Then, the interest is added to the balance, and then the balance is decreased by the amount, provided that the balance does not fall below the owner's overdraft limit; otherwise, an error message is printed.

a Develop a UML class diagram to describe the above.

b Write C++ class headers to support the above. For the representation of dates assume a class `Date` defined as follows:

```
class Date{ public:  
    Date(int day, int month, int year) { . . . }  
    int daysUntil(const Date& aDate) . . . }  
    // returns number of days between receiver and aDate  
    . . . };
```

c Write a test function that:

- i) creates two banks: the Listening Bank with an interest rate of 0.030, and the Talking Bank with an interest rate of 0.025,
- ii) creates two people: Kenneth with an overdraft limit of 100.00, and Gordon with an overdraft limit of 45,000.00,
- iii) creates A1, an account for Kenneth, with the Listening Bank, on the 2nd March 2006, with an initial balance of 230.00, and creates A2, an account for Gordon, with the Talking Bank, on the 5th May 1998, with an initial balance of 56,000.00,
- iv) withdraws 300.00 from A1 on the 10th January 1999, and pays 500.00 into A2 on the 4th March 1999,
- v) sets the interest rate of the Talking Bank to 0.035.

d Write C++ function bodies for all functions introduced in part b..

*Note: There are many ways of mapping the UML diagram into C++ classes. If you do it in a particular way, you will not need lists or any other form of collection classes.*