

Object-Oriented Programming Lab#7, Spring 2019

Today's Topics

- Inheritance
- method override
- subclass polymorphism

A Banking System

Create a **Banking System**, where a user can **create new account**, **deposit** money, **withdraw** money and **check** the balance. There are different types of BankAccount a user can create. See below for the requirements of different types of account.

- **Savings account:** A savings account allows user to accumulate *interest* on funds he has saved for future needs. Savings account required a *minimum balance*. For our purpose let's assume the **minimum balance** is 2000 Tk and **interest rate** is 5%. From savings account, user is only **allowed to withdraw a maximum amount** of money which will be set up during the account creation.
- **Current account:** Current account offers easy access to your money for your daily transactional needs and help keep your cash secure. You need a **trading license** to open a Current account. There is no restriction on how much money you can withdraw from Current account but you need a *minimum balance* of 5000 TK in your account.

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What you need to do:

1. Create the **BankAccount** class:

- Add 4 instance variables; **memberName**, **accountNumber**, **accountBalance**, **minimumBalance**.
- Implement constructor. You need to pass **memberName**, **accountBalance** & **minimumBalance** as parameter.
 - You need to auto-generate a 5 digit **accountNumber** inside the constructor. So, you do not need to pass the **accountNumber** as a parameter in the constructor. (See the example below for how to generate 5 digit random number)
- Add the following methods
 - **void deposit(double amt).**
 - **void withdraw(double amt)**
 - You should only allow withdrawing if the **accountBalance** is equal or more than **minimumBalance** after withdrawing.
 - **double getBalance()** which will return the **accountBalance** attribute.
 - **void display()** - Print the value of all attributes.

Code to generate 5 digit random number: (3 different examples below)

The **num** variable in the examples below will store a 5 digit number in String format.

Example1:

```
Random rand = new Random();
String num = "" + rand.nextInt(10) + rand.nextInt(10)+ rand.nextInt(10)+
rand.nextInt(10)+ rand.nextInt(10);
```

Example2:

```
Random rand = new Random();
String num = 10000 + rand.nextInt(89999) + "";
```

Example3:

```
String num = 10000 + (int)(Math.random()*89999) + "";
```

2. Create a **SavingsAccount** class:

- This class is a **subclass** of **BankAccount** class.
- This will have **two additional** instance variables
 - One is **"interest"** and initialized to 5%.
 - Another variable for *maximum withdraw* amount limit, name it as **maxWithLimit**.
- Implement constructor.

You need to pass **memberName**, **accountBalance** , and **maxWithLimit** as parameter. Inside the constructor, call parent class's constructor.

- Override **getBalance()** method.

This method will calculate the total interest of the **accountBalance** value and return (**accountBalance** + total interest) but it won't change the **accountBalance** value.

- Override **withdraw(double amount)** method.

This method will allow to withdraw money if the withdraw **amount** is less than the **maxWithLimit** and doesn't set the **accountBalance** less than **minimumBalance** after withdraw. So, you need to check the **maxWithLimit** condition and then call the **withdraw()** method of **BankAccount** class.

3. Create a **CurrentAccount** class:

- Should **extend** the **BankAccount** class
- Add an instance variable **tradeLicenseNumber**.
- Implement constructor.

You need to pass **memberName**, **accountBalance**, and **tradeLicenseNumber** as parameter. Inside the constructor, call parent class's constructor.

4. Now create a class name "**Bank**" which will mimic a real Bank that holds a list of **BankAccount**. You can use an Array or ArrayList to hold the list of **BankAccount**. So, the class will have only one attribute **BankAccount[] accounts**. Add the following methods to the class.

- **void addAccount(BankAccount)**
 - This method will add a new **BankAccount** object to the list **accounts**. Use the parameters to create the BankAccount object.
- **void addAccount(String name, double balance, double minimumBal, double maxWithimit)**
 - This method will create a **SavingsAccount** object **acc** using the parameter provided and add the account to the list using **addAccount(BankAccount acc)** method.
- **void addAccount(String name, double balance, String tradeLicense)**
 - This method will create a **CurrentAccount** object using the parameter provided and add the account to the list using **addAccount(BankAccount acc)** method.
- **BankAccount findAccount(String accountNum)**
 - This method will loop through the list of the BankAccount (**accounts**) and find the account that has matching **accountNumber** as the parameter. If the matching **BankAccount** is available return the object otherwise return null.
- **void deposit(String accountNum, double amt)**
 - Inside the method call **findAccount(String accountNum)** to find the **BankAccount** with matching **accountNum** and then call **deposit(double amt)** method of that object.
- **void withdraw(String accountNum, double amt)**
 - Inside the method call **findAccount(String accountNum)** to find the **BankAccount** with matching **accountNum** and then call **withdraw(double)** method of that object.

- **void display()**
- Loop through the list of the **BankAccounts** (*accounts variable*) and call **display ()** method of **BankAccount** class.

5. Create an **application class** (that has the main method) named "**BankApp**" which will have the **main** method.

- In the main method, declare a variable '**bank**' of **Bank** type. Display the following menu to user and take necessary action(call appropriate method for **bank** variable).

- Input '1' to add a new Account.

You need to provide a submenu to create different types of account. You have to ask for **what type of BankAccount** he/she wants to open. Depending on the user response you need to ask for the remaining inputs and then create the account (**SavingsAccount** or **CurrentAccount** object) and assign it to **bank** variable.

- Input '2' to deposit to an existing account
- Input '3' to withdraw from an account.
- Input '4' to display the list of the accounts.
- Input '0' to exit the system.