



Java and C# in depth

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Java: overview by example



Bank Account

A Bank Account

- maintain a balance (in CHF) of the total amount of money
 - balance can go negative
- can open an account with an initial sum of money
- can deposit money on the account
 - deposit is effective only for a nonnegative amount of money
- can withdraw money from the account
 - withdraw is effective only for a nonnegative amount of money

Java implementation: BankAccount class

```
public class BankAccount {  
    ...  
}
```

Attribute `balance`



- maintain a balance (in CHF) of the total amount of money

```
public class BankAccount {  
  
    // Attribute 'balance' inaccessible by clients  
    private int balance;  
  
    // Public getter for 'balance'  
    public int getBalance() { return balance; }  
  
    // Restricted setter for 'balance'  
    protected void setBalance(int balance) {  
        this.balance = balance;  
    }  
  
    ...  
}
```



Constructor: open a new account

- can open an account with an initial sum of money

```
public class BankAccount {  
    ...  
    // no-arg constructor  
    public BankAccount() { balance = 0;}  
  
    // 1-arg constructor  
    public BankAccount(int initialBalance) {  
        if (initialBalance >= 0) {  
            balance = initialBalance;  
        }  
        else throw new BankAccountException("...")  
    }  
    ...  
}
```

Method `deposit`



- can deposit money on the account
 - deposit is effective only for a nonnegative amount of money

```
public class BankAccount {  
    ...  
    // deposit 'amount'  
    // don't do anything if 'amount' < 0  
    public void deposit(int amount) {  
        if (amount >= 0) {  
            balance = balance + amount;  
        }  
    }  
    ...  
}
```

Method `withdraw`

- can withdraw money on the account
 - withdraw is effective only for a nonnegative amount of money.

```
public class BankAccount {  
    ...  
    // withdraw allowed 'amount'  
    // access restricted only to some clients  
    protected int withdraw(int amount) {  
        if (amount >= 0) {  
            balance = balance - amount;  
            return 0;  
        }  
        else { return -1; }  
    }  
    ...  
}
```



Premium Bank Account

A special Bank Account:

- basic functionalities as in a regular Bank Account
- has a minimum balance and a fixed fee
- if the balance goes below the minimum balance, the fee is automatically deducted from the balance
 - example:
 - minimum balance = 200, fee = 15
 - if a withdrawal brings the balance down to 150, an additional 15 is deducted, so the final balance after the deposit is 135

Java implementation:

PremiumBankAccount class inheriting from BankAccount

```
public class PremiumBankAccount
    extends BankAccount {
    ...
}
```

New attributes



- has a minimum balance and a fee

```
public class PremiumBankAccount extends BankAccount {  
  
    public final int minimumBalance = 200;  
  
    public final int lowBalanceFee = 15;  
  
    ...  
}
```

New constructor



```
public class PremiumBankAccount extends BankAccount {  
    ...  
  
    // constructor  
    public PremiumBankAccount(int initialBalance) {  
        if(initialBalance >= minimumBalance) {  
            setBalance(initialBalance);  
        }  
        else{  
            throw new BankAccountException("...");  
        }  
    }  
    ...  
}
```

Redefining withdraw



- if the balance goes below the minimum balance, the fee is automatically deducted from the balance

```
public class PremiumBankAccount extends BankAccount {
    ...
    // overrides corresponding method in BankAccount
    protected int withdraw(int amount) {
        int res = super.withdraw (amount);
        if (res == 0 && getBalance() < minimumBalance) {
            setBalance (getBalance() - lowBalanceFee);
            return 0;
        }
        else { //handle other cases here }
    }
    ...
}
```

Clients of the BankAccount Class

- A client class which runs two instances of BankAccount

```
public class BankClient {  
  
    public static void main(String[] args) {  
        BankAccount ba = new BankAccount();  
        BankAccount pba = new PremiumBankAccount(250);  
        System.out.println(ba.getBalance());  
        System.out.println(pba.getBalance());  
        ba.deposit(1800);  
        pba.withdraw(100);  
        System.out.println(ba.getBalance());  
        System.out.println(pba.getBalance());  
    }  
}
```

Running a Java application



```
> javac BankAccount.java  
    PremiumBankAccount.java  
    BankClient.java  
> java BankClient
```

0

250

1800

135