

Inheritance

The purpose of this exercise is to practice writing code that uses the Object-Oriented Programming principle of [inheritance](#).

Learning objectives

After completing this exercise, students will be able to:

- Describe the purpose and use of inheritance in an Object-Oriented Programming environment
- Define and use superclasses and subclasses in an inheritance hierarchy
- Identify superclasses and subclasses from viewing source code
- Define an IS-A relationship in reference to inheritance
- Define what overriding means in the context of inheritance
- Describe what's being inherited
- Describe how access modifiers work in an inheritance relationship
- Use super class constructors in a subclass

Evaluation criteria and functional requirements

- The project must not have any build errors.
- Code is presented in a clean, organized format.
- Code is appropriately encapsulated.
- Inheritance is used appropriately to avoid code duplication.
- The code meets the specifications defined below.

Bank teller application

Notes for All Classes

- All attributes have **private** access.
- X in the get column indicates the attribute **should have a get accessor**.
- X in the set column indicates the attribute **should have a set accessor**.

Instructions

Create three new classes to represent a bank account, savings account, and a simple checking account.

1. Implement the **BankAccount** class

The **BankAccount** class represents a simple checking or savings account at a bank.

Constructor	Description
BankAccount(String accountHolderName, String accountNumber)	A new bank account requires an account holder name and account number. The balance defaults to a 0 dollar balance if not specified.

Constructor		Description		
BankAccount(String accountHolderName, String accountNumber, int balance)		A new bank account requires an account holder name and account number. The balance is initialized to the dollar balance given.		
Attribute Name	Data Type	Get	Set	Description
accountHolderName	String	X		Returns the account holder name that the account belongs to.
accountNumber	String	X		Returns the account number that the account belongs to.
balance	int	X		Returns the balance value of the bank account in dollars.
Method Name	Return Type	Description		
deposit(int amountToDeposit)	int	Adds amountToDeposit to the current balance, and returns the new balance of the bank account.		
withdraw(int amountToWithdraw)	int	Subtracts amountToWithdraw from the current balance, and returns the new balance of the bank account.		

2. Implement the **CheckingAccount** class

A **CheckingAccount** "is-a" **BankAccount**, but it also has some additional rules:

Override Method	Description
Withdraw	If the balance falls below \$0.00 and is less than -\$100.00, a \$10.00 overdraft fee is also charged against the account.

Checking account can't be overdrawn by \$100.00 or more. If a withdrawal request leaves the account \$100 or more overdrawn, it fails and the balance remains the same.

For example, if the current balance is -\$89.00, and the amount to withdraw is \$10.00, the resulting balance is -\$99.00. The withdraw is permitted since the new balance is less than -\$100.00. The \$10.00 overdraft fee is then charged against the account, resulting in a final balance of -\$109.00.

A withdrawal of \$11.00 in the same situation fails because the new balance is -\$100.00 which is equal to **but not less than** the limit of -\$100.00.

3. Implement the **SavingsAccount** class

A **SavingsAccount** "is-a" **BankAccount**, but it also has some additional rules:

Override Method	Description
withdraw	If the remaining balance is less than \$150 when a withdrawal is made, an additional \$2 service charge is withdrawn from the account.
	If a withdrawal is requested for more than the current balance, the withdrawal fails and the balance remains the same. No fees are incurred.

Sample usage

```
BankAccount checkingAccount = new CheckingAccount("Bernice", "CHK:1234");
BankAccount savingsAccount = new SavingsAccount("Bernice", "SAV:9876");

int amountToDeposit = 2;
int newBalance = checkingAccount.deposit(amountToDeposit);
```

Challenge

The industry standard way to deal with decimal numbers in Java is with the `BigDecimal` class. Can you change the `balance` variables in the classes above to use `BigDecimal` instead of `int`?

Tips and tricks

- A good way to determine if you're implementing inheritance correctly is to read the code or classes out loud. A child class "is-a" type of its parent. For instance, a `CheckingAccount` "is-a" `BankAccount`. Is a `BankCustomer` a `BankAccount`, or does a `BankCustomer` have a `BankAccount`? Thinking about the relationships of objects in these terms helps you to quickly identify opportunities to improve your code.

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- [derived-properties](#)
 - [inheritance-and-an-is-a-relationship](#)
 - [oop-inheritance](#)
 - [what-is-polymorphism](#)