Object Inheritance

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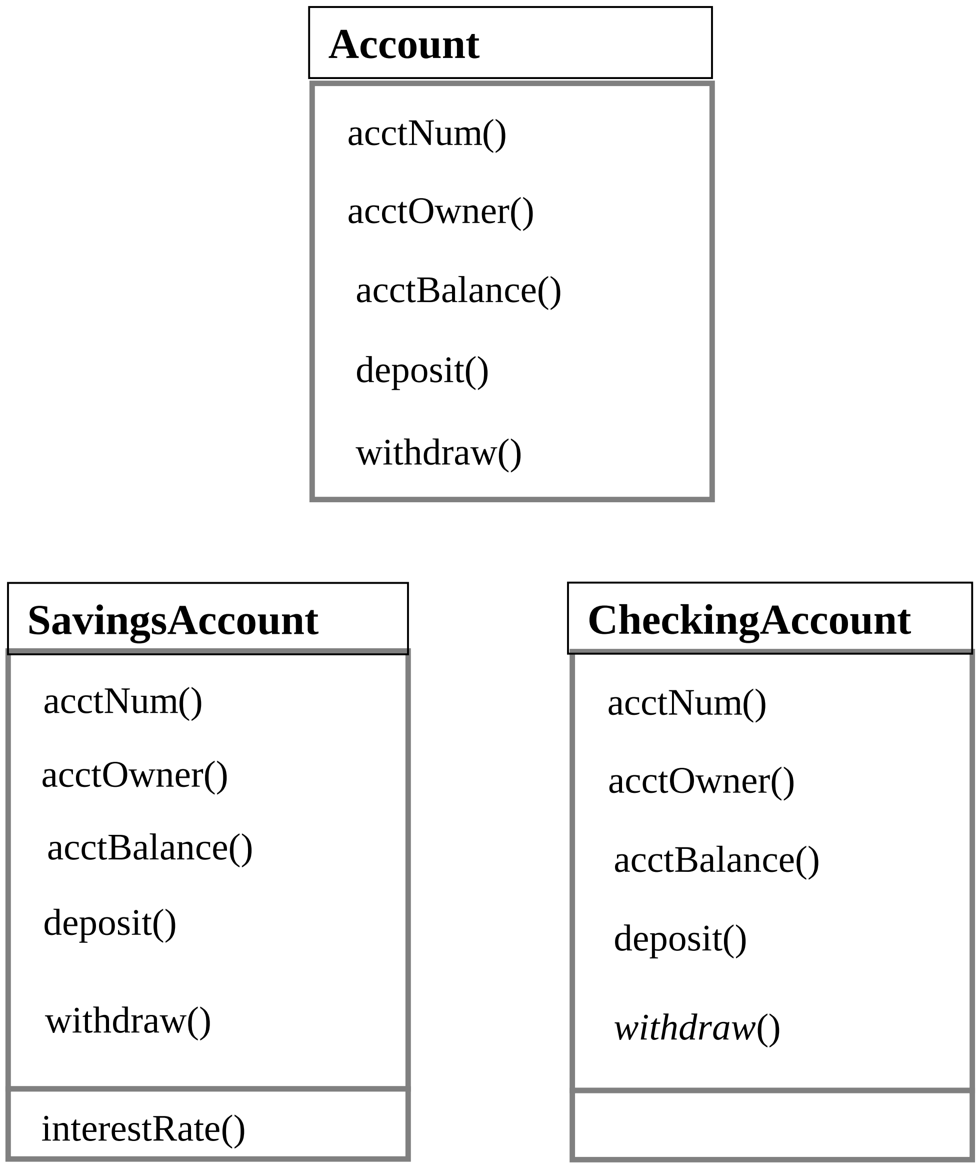
An Inheritance Hierarchy



Inheritance

- Classes may be arranged in a class hierarchy where one class (**base class**) is a generalisation of one or more other classes (**derived classes**).
- A derived class **inherits** the **attributes** and **behaviours** from its base class and **may add new operations** or **attributes** of its own.
- Generalisation is implemented as inheritance in OOP languages.

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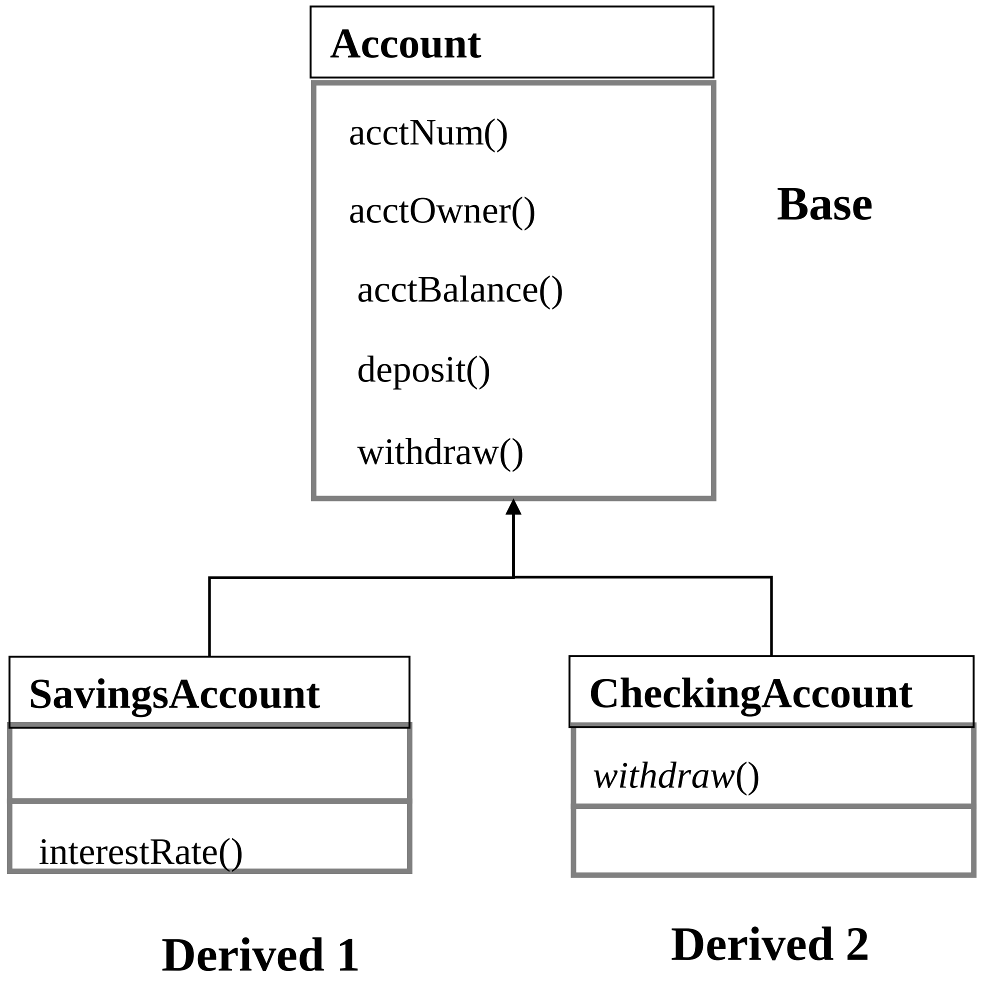


Advantages of Inheritance

- It is a **reuse mechanism** at both the design and the programming level
- It is an **abstraction mechanism** which may be used to classify entities

Base class and Derived class

- The advantage of making a new class a derived class is that it will *inherit* attributes and operations of its base class.
- Derived classes extend existing classes in three ways:
  - By defining new (additional) attributes and operations.
  - By overriding (changing the behavior) existing operations.
  - By hiding existing attributes and operations.

Derived classes

- Derived classes are used to define special cases, extensions, or other variations from the originally defined class.

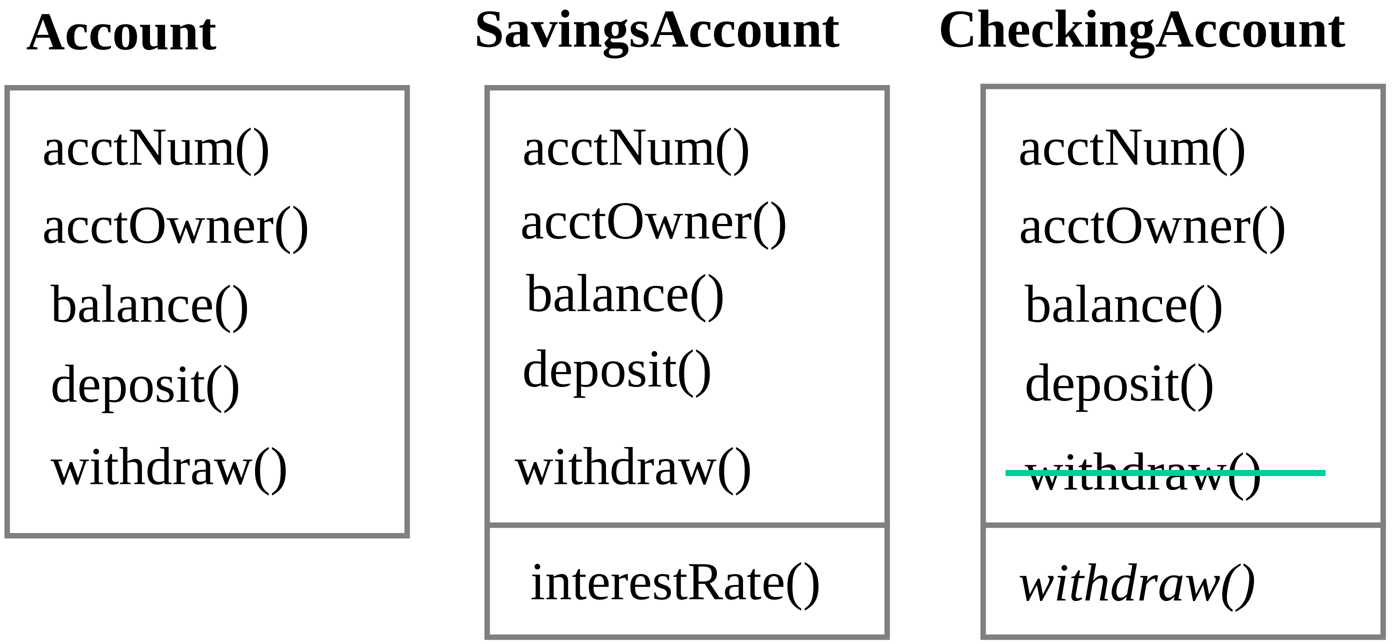
Example: ***SavingsAccount*** and ***CheckingAccount*** can be derived from the ***Account*** class

```
class Account {
  private:
        string number;
        string owner;
        double balance;
  public:
        string acctNum() {…}
        string acctOwner() {…}
        double balance() {…}
        void deposit(double) {…}
        void withdraw(double) {…}
};
```

```
class SavingsAccount : public Account {
   private:
        double intRate;
   public:
 void interestRate(double) {…}
};
```

```
class CheckingAccount: public Account {
   public:
        void withdraw(double) {…}
};
```

Derived classes



- No new code has to be written for ***acctNum()***, ***acctOwner()***, ***balance()***, and ***deposit()*** operations, they are **inherited** from the **base class** into the **derived classes**.
- ***SavingsAccount*** inherited ***withdraw()*** operation and added a new ***rate()*** operation.
- ***CheckingAccount*** has different rules to follow for withdraw, i.e, overrode ***withdraw()*** operation.

Inheritance: Rules

- Derived class **inherits** but **cannot access** **private member variables**
- Derived class does not inherit **private member functions.**
- Derived class **inherits** every **non-private member variables** and **non-private member functions** except:
  - **Constructors** (default, regular, copy, and move)
  - **Destructor**
  - **Assignment operators** (copy assignment and move assignment)
- Derived class does not inherit **friend functions**