- Examples

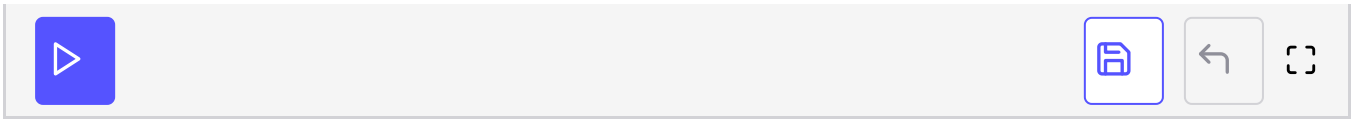
To get a deeper understanding of inheritance, we'll look at a few examples in this lesson.

WE'LL COVER THE FOLLOWING

Example 1: Inheritance

```
#include <iostream>

class Account{

public:
   Account(double b): balance(b){}

   void deposit(double amt){
     balance += amt;
   }

   void withdraw(double amt){
     balance -= amt;
   }

   double getBalance() const {
     return balance;
   }

private:
   double balance;

};
```

```
class BankAccount: public Account{


public:
  // using Account::Account;
  BankAccount(double b): Account(b){}

  void addInterest(){
    deposit( getBalance()*0.05 );
  }
};

int main(){

  std::cout << std::endl;

  BankAccount bankAcc(100.0);
  bankAcc.deposit(50.0);
  bankAcc.deposit(25.15);
  bankAcc.withdraw(30);
  bankAcc.addInterest();

  std::cout << "bankAcc.getBalance(): " << bankAcc.getBalance() << std::endl;

  std::cout << std::endl;

}
```



Explanation

- We have created two classes, i.e., `Account` and `BankAccount`.
- The `BankAccount` class inherits the `Account` class publicly in line 25.
- The `public` member functions of the `Account` class are available to the `BankAccount` class and we can access them using the `.` operator (line 46).

Example 2: Abstract base class inheritance

```
#include <iostream>
#include <string>

class Abstract{
public:
    virtual ~Abstract() = 0;
};

Abstract::~Abstract(){}

class Concret: public Abstract{};
```

```
class HumanBeing{
public:
  HumanBeing(const std::string n): name(n){

    std::cout << name << " created." <<  std::endl;
  }

  virtual std::string getSex() const= 0;

private:
  std::string name;

};

class Man: public HumanBeing{
public:

  // using HumanBeing::HumanBeing;
  Man(const std::string n): HumanBeing(n){}

  std::string getSex() const{
    return "male";
  }
};


class Woman: public HumanBeing{
public:

  // using HumanBeing::HumanBeing;
  Woman(const std::string n): HumanBeing(n){}

  std::string getSex() const{
    return "female";
  }
};

int main(){

  std::cout << std::endl;

  // Abstract abstract;    // ERROR
  Concret concret;

  // HumanBeing humanBeing("grimm");   // ERROR

  Man schmidt("Schmidt");
  Woman huber("Huber");

  std::cout << "schmidt.getSex(): " <<  schmidt.getSex() << std::endl;
  std::cout << "huber.getSex(): " << huber.getSex() << std::endl;

  std::cout << std::endl;

}
```

Explanation

- We have created a pure virtual class `Abstract` and we cannot make an instance of this class as it will give an error.
- The classes `Man` and `Woman` inherit publically from the class `HumanBeing`.
- `getSex` function is pure virtual so we cannot make an instance of `HumanBeing` in `main`.
- The instances of the `Man` and `Woman` classes can access the `getSex` function by using the `.` operator and they must be overridden in derived classes.

Example 3: Access rights in inheritance

```
class Account{
public:
  int pub{0};
protected:
  int prot{0};
private:
  int pri{0};
};

class PubAccount: public Account{
public:
  PubAccount(){
    pub + prot;  // public + protected
  }
};

class ProtAccount: protected Account{
public:
  ProtAccount(){
    pub + prot;  // protected + protected
  }
};

class PriAccount: private Account{
public:
  PriAccount(){
    pub + prot;  // private + private
  }
};


int main(){

  PubAccount pubAccount;
  ProtAccount proAccount;
  PriAccount priAccount;
```

```
  pubAccount.pub;

}
```

Explanation

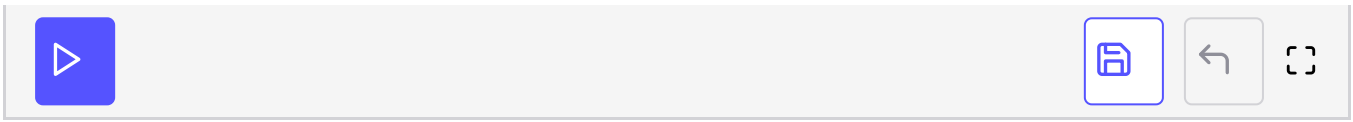
In this example, we figured out the different access rights available to classes when inheriting a parent class using `public`, `protected`, and `private` keywords.

- Only in the case of the `pubAccount` class, can we access the publicly available member of the base class in `main`.
- For the `priAccount` and `proAccount` classes, we can access public and protected members' variables in derived classes, but not in `main`.

Example 4: Base class inheritance

```
#include <iostream>
#include <string>

class Account{
public:

  Account() = default;

  Account(double amt, std::string c): amount(amt), cur(c){
    std::cout << "Account:amount: " << amount << std::endl;
    std::cout << "Account:cur: " << cur << std::endl;
  }

private:
  double amount;
  std::string cur;
};

class BankAccount: public Account{
public:
  BankAccount(double amt, std::string n): Account(amt, "EUR"), name(n){
    std::cout << "BankAccount:name: "  << name << std::endl;
  }
private:
  std::string name;

};

int main(){

  std::cout << std::endl;
```

```
  Account acc(100.0, "USD");

  std::cout << std::endl;

  BankAccount bankAcc(200.0, "grimm");

  std::cout << std::endl;

}
```



Explanation

- We have created two classes,i.e., `Account` and `BankAccount`.
- The class `BankAccount` inherits publically from the `Account` class.
- We have created two instances of these classes in `main`.
- For the `BankAccount` class, if the `cur` parameter is not passed, then the default `EUR` is passed to the `Account` class.

In the next lesson, we'll solve a few exercises.