- Examples

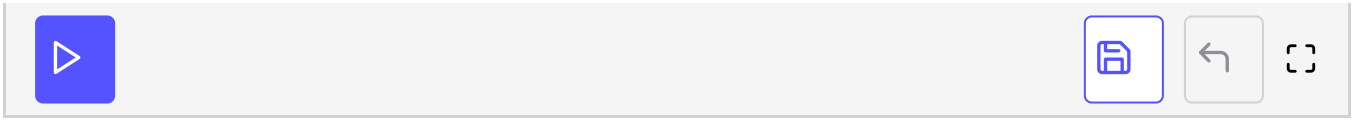
In this lesson, we'll discuss the examples of final and override.

WE'LL COVER THE FOLLOWING

Example 1: Override final

```
#include <iostream>

class Sort{
public:
  virtual void processData(){
    readData();
    sortData();
    writeData();
  }
private:
  virtual void readData(){}
  virtual void sortData() = 0;
  virtual void writeData(){}
};


class QuickSort: public Sort{
private:
  void readData(){
    std::cout << "readData" << std::endl;
  }
  void sortData(){
    std::cout <<  "sortData" << std::endl;
  }
  void writeData(){
    std::cout << "writeData" << std::endl;
  }
```

```
};


int main(){

  std::cout << std::endl;

  Sort* sort = new QuickSort;
  sort->processData();

  std::cout << std::endl;

}
```



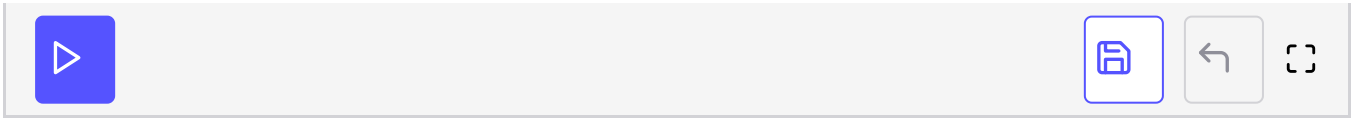
Explanation

- We have implemented two classes named `Sort` and `QuickSort`.
- We have created three private `virtual` methods and a public `virtual` method `processData` in the `Sort` class which calls the three private methods.
- The `QuickSort` class publicly inherits from the `Sort` class.
- We have overridden the methods of the `Sort` class in `QuickSort`.
- By using a pointer to the Base class, we can access the overridden methods of the derived class.

Example 2: Override

```
class Base {

  void func1();
  virtual void func2(float);
  virtual void func3() const;
  virtual long func4(int);

  virtual void f();

};

class Derived: public Base {

  // ill-formed; no virtual method func1 exists
  virtual void fun1() override;

  // ill-formed: bad type
```

```
  virtual void func2(double) override;

  // ill-formed: const missing
  virtual void func3() override;

  // ill-formed: wrong return type
  virtual int func4(int) override;

  // well-formed: f override Base::f
  virtual void f() override;

};

int main(){

  Base base;
  Derived derived;

};
```



Explanation

When we compile the program, the compiler will complain a lot. The error message is very specific.

The compiler complains in line 15 that the method `func1` is not overriding a method. The same holds true for `func2`. It has the wrong parameter type. Continuing with the method `func3`, it complains that `func3` has no `const` qualifier. `func4` has the wrong return type. Only the method `f` in line 27 correctly overrides the method `f` of its base class.

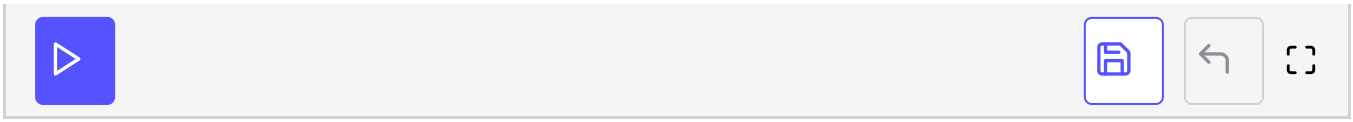
`final` is the right tool for the job if a virtual method should not be overridden.

Example 3: `final`

> The given function causes a compilation error because the base method is declared `final`.

```
class Base {
  virtual void h(int) final;

  virtual void g(long int);
};
```

```
class Derived: public Base {


  // ill-formed: base method declared final
  virtual void h(int);

   // well-formed: a new virtual function
  virtual void h(double);

  virtual void g(long int) final;
};

class DerivedDerived: public Derived {
  virtual void g(long int);
};

struct FinalClass final { };
struct DerivedClass: FinalClass { };

int main(){

  Base base;
  Derived derived;
  DerivedDerived derivedDerived;

  FinalClass finalClass;
  DerivedClass derivedClass;

};
```



Explanation

The compiler performs its job neatly. It complains that the method `h` in the class `Base` (line 2) is overridden by the method in class `Derived` (line 10). Of course, it's okay that the method `h` (line 13) in class `Derived` overloads `f` for the parameter type `double`. This method `g` (line 15) in the class `Derived` is quite interesting. The method overrides the method `g` (line 4) of the class `Base` and declares the method `final`. Therefore, `g` cannot be overridden in `DerivedDerived` (line 19).

`DerivedClass` cannot be derived from `FinalClass`, because the `BaseClass` is `final`.

In the next lesson, we'll solve an exercise related to the example given in this lesson.