
Inheritance and Polymorphism

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Overriding Base Class Functions

- A derived class can override a member function of its base class by defining a derived class member function with the same name and parameter list

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Example

```
class TFaculty: public Faculty
{
    private:
        string title;
    public:
        TFaculty(string fname, Discipline d, string title) :
            Faculty(fname, d)
        {
            setTitle(title);
        }
        void setTitle(string title) { this->title = title; }
        string getName() { return title + " " + name; }
}
```

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Type Compatibility

- Objects of a derived class can be used wherever objects of a base class object are expected
- Rules for pointers and objects:
 - A derived class pointer can always be assigned to a base class pointer
 - A type cast is required to perform the opposite assignment

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Example

```
class Base
{
public:
    int i;
    Base(int k) { i = k; }
};
class Derived : public Base
{
public:
    double d;
    Derived(int k, double g) : Base(k) { d = g; }
};
```

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Which are allowed?

- Base *pb = new Base(5);
- Derived *pd = new Derived(6, 10.5);
- Base *pb1 = pb;
- Base *pb2 = new Derived(7, 11.5);
- Derived *pd1 = static_cast<Derived *>(pb1);

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Polymorphism

- Code is said to be polymorphic if executing the code with different types of data produces different behavior
- Program in the general, rather than program in the specific
- Virtual functions make polymorphism possible

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Polymorphism in Action

- Is this code polymorphic?

```
const int NUM_PEOPLE = 5;

Person *arr[NUM_PEOPLE] = {
    new Tfaculty("Indiana Jones", ARCHEALOG, "Dr."),
    new Student("Thomas Cruise", COMPUTER_SCIENCE, NULL),
    new Faculty("James Stock", BIOLOGY),
    new Tfaculty("Sharon Rock", BIOLOGY, "Professor"),
    new Tfaculty("Nicole Eweman", ARCHEOLOGY, "Dr.")};

for (int k = 0; k < NUM_PEOPLE; k++)
{
    cout << arr[k]->getName() << endl;
}
```

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Polymorphism

- You can tell the compiler to select the more specialized version of a member function by declaring the member function to be a virtual function
- Declare a virtual function by prefixing its declaration with the word virtual

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