
this Pointer, Constant Functions, Static Data Members, and Static Member Functions

this Pointer (11.1)

- functions - only one copy of each function exists in memory independent of the number of objects instantiated using the class declaration
- data members - each unique object of a particular class has space allocated for the data members of the class
- this - is a pointer that can be used to access an objects data members. this is an implicit argument to all class methods, constructors, and destructors.

Example of this pointer

```
#ifndef RATIONAL_H
#define RATIONAL_H

using namespace std;

class Rational
{
public:
    Rational(int, int);
    print();

private:
    int numerator;
    int denominator;
};

#endif
```

Example

```
#include "Rational.h"

Rational::Rational(int numerator, int denominator)
{
    (*this).numerator = numerator;
    (*this).denominator = denominator;
}

Rational::print()
{
    cout << numerator << '/' << denominator;
}
```

Pointers

- Accessing data members and pointers using pointers
- `(*this).numerator` can be replaced with
- `this->numerator`

Write the definition for setTime

```
class Time
{
    private:
        int hour;
        int minute;
        int second;
    public:
        Time();
        Time(int hour = 0, int minute = 0, int second = 0);
        int getHour();
        int getMinute();
        int getSecond();
        void setTime(int hour, int minute, int second);
        void printUniversal();
        void printStandard();
}; // end class Time
```

const

- Many things can be specified as const in C++
- Examples:
 - Objects
 - Member Functions
 - Data members
 - Function arguments

const Objects

- Principle of least privilege
- What happens when we declare any object to be a const?
- Example:
 - `const int SIZE = 50;`
- What do you think it means if I have
 - `const Time dinnerTime(18, 30, 0);`
- What member functions of class Time do you think dinnerTime can call?

const Member Functions

- A const object can only call const functions
- How do we declare member functions to be const?
 - Use the const keyword in both the function prototype and the function definition
 - Appears after the parameter list
- const member functions CANNOT modify data members (i.e. the current instantiation of the class)

Time Example

```
class Time
{
    private:
        int hour;
        int minute;
        int second;
    public:
        Time();
        Time(int = 0, int = 0, int = 0);
        int getHour() const;
        int getMinute() const;
        int getSecond() const;
        void setTime(int, int, int);
        void printUniversal() const;
        void printStandard() const;
}; // end class Time
```

Object Details

- What does memory look like after creating multiple objects of a class?
- For example:
 - `Time t(3, 45, 00);`
 - `Time t2(5, 29);`
 - `Time t3(14);`
 - `Time t4;`
 - `Time *pTime = new Time();`
