7.5 Using the `this` Pointer

- **`this`** pointer
  - Allows objects to access their own address
  - Not part of the object itself
  - Implicit first argument on member function call to the object
  - Implicitly reference member data and functions
  - The type of the **`this`** pointer depends upon the type of the object and whether the member function using **`this`** is **`const`**
  - In a non-**`const`** member function of **`Employee`**, **`this`** has type

    ```
    Employee* const
    ```

    - Constant pointer to an **`Employee`** object
  - In a **`const`** member function of **`Employee`**, this has type

    ```
    const Employee* const
    ```

    - Constant pointer to a constant **`Employee`** object

7.5 Using the this Pointer

- Examples using **`this`**
  - For a member function print data member **`x`**, either

```
this->x
```

or

```
( *this ).x
```

- Cascaded member function calls
  - Function returns a reference pointer to the same object

```
{ return *this; }
```

  - Other functions can operate on that pointer
  - Functions that do not return references must be called last

7.5 Using the this Pointer

- Example of cascaded member function calls
  - Member functions **`setHour`**, **`setMinute`**, and **`setSecond`** all return **`*this`** (reference to an object)
  - For object **`t`**, consider

    ```
    t.setHour(1).setMinute(2).setSecond(3);
    ```

  - Executes **`t.setHour(1)`**, returns **`*this`** (reference to object) and the expression becomes

    ```
    t.setMinute(2).setSecond(3);
    ```

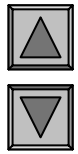
  - Executes **`t.setMinute(2)`**, returns reference and becomes

    ```
    t.setSecond(3);
    ```

  - Executes **`t.setSecond(3)`**, returns reference and becomes

    ```
    t;
    ```

  - Has no effect



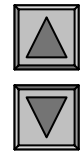
Outline


```
1  // Fig. 7.7: fig07_07.cpp
2  // Using the this pointer to refer to object members.
3  #include <iostream>
4
5  using std::cout;
6  using std::endl;
7
8  class Test {
9  public:
10    Test( int = 0 );              // default constructor
11    void print() const;
12 private:
13    int x;
14 };
15
16 Test::Test( int a ) { x = a; }  // constructor
17
18 void Test::print() const    // ( ) around *this
19 {
20    cout << "         x = " << x
21         << "\n  this->x = " << this->x
22         << "\n(*this).x = " << ( *this ).x << endl;
23 }
24
25 int main()
26 {
27    Test testObject( 12 );
28
29    testObject.print();
30
31    return 0;
32 }
```

Printing **x** directly.

Print **x** using the arrow **->** operator off the **this** pointer.

Printing **x** using the dot (**.**) operator. Parenthesis required because dot operator has higher precedence than *****. Without, interpreted incorrectly as ***(this.x)**.

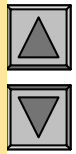


Outline

Program Output

```
        x = 12
  this->x = 12
(*this).x = 12
```

All three methods have the same result.

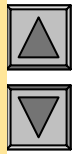


Outline

1. Class definition

```
1  // Fig. 7.8: time6.h
2  // Cascading member function calls.
3
4  // Declaration of class Time.
5  // Member functions defined in time6.cpp
6  #ifndef TIME6 H
7  #define TIME6 H
8
9  class Time {
10 public:
11    Time( int = 0, int = 0, int = 0 );  // default constructor
12
13    // set functions
14    Time& setTime( int, int, int ); // set hour, minute, second
15    Time& setHour( int );     // set hour
16    Time& setMinute( int );   // set min
17    Time& setSecond( int );   // set sec
18
19    // get functions (normally declared
20    int getHour() const;      // return
21    int getMinute() const;    // return minute
22    int getSecond() const;    // return second
23
24    // print functions (normally declared const)
25    void printMilitary() const;  // print military time
26    void printStandard() const;  // print standard time
27 private:
28    int hour;              // 0 - 23
29    int minute;            // 0 - 59
30    int second;            // 0 - 59
31 };
32
33 #endif
```

Notice the **`Time&`** - function returns a reference to a **`Time`** object. Specify object in function definition.



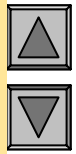
Outline

1. Load header file

1.1 Function

```
34 // Fig. 7.8: time.cpp
35 // Member function definitions for Time class.
36 #include <iostream>
37
38 using std::cout;
39
40 #include "time6.h"
41
42 // Constructor function to initialize private data.
43 // Calls member function setTime to set variables.
44 // Default values are 0 (see class definition).
45 Time::Time( int hr, int min, int sec )
46    { setTime( hr, min, sec ); }
47
48 // Set the values of hour, minute, and second.
49 Time& Time::setTime( int h, int m, int
50 {
51    setHour( h );
52    setMinute( m );
53    setSecond( s );
54    return *this;   // enables cascading
55 }
56
57 // Set the hour value
58 Time& Time::setHour( int h )
59 {
60    hour = ( h >= 0 && h < 24 ) ? h : 0;
61
62    return *this;   // enables cascading
63 }
64
```

Returning **`*this`** enables cascading function calls

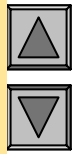


Outline

1.1 Function

```
65 // Set the minute value
66 Time& Time::setMinute( int m )
67 {
68    minute = ( m >= 0 && m < 60 ) ? m : 0;
69
70    return *this;   // enables cascading
71 }
72
73 // Set the second value
74 Time& Time::setSecond( int s )
75 {
76    second = ( s >= 0 && s < 60 ) ? s : 0;
77
78    return *this;   // enables cascading
79 }
80
81 // Get the hour value
82 int Time::getHour() const { return hour; }
83
84 // Get the minute value
85 int Time::getMinute() const { return minute; }
86
87 // Get the second value
88 int Time::getSecond() const { return second; }
89
90 // Display military format time: HH:MM
91 void Time::printMilitary() const
92 {
93    cout << ( hour < 10 ? "0" : "" ) << hour << ":"
94         << ( minute < 10 ? "0" : "" ) << minute;
```

Returning **`*this`** enables cascading function calls



Outline

1.1 Function

---

1. Load header

1.1 Initialize `Time` object

2. Function calls

3. Print values

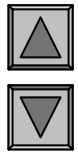
```
95 }
96
97 // Display standard format time: HH:MM:SS AM (or PM)
98 void Time::printStandard() const
99 {
100    cout << ( ( hour == 0 || hour == 12 ) ? 12 : hour % 12 )
101         << ":" << ( minute < 10 ? "0" : "" ) << minute
102         << ":" << ( second < 10 ? "0" : "" ) << second
103         << ( hour < 12 ? " AM" : " PM" );
104}
105// Fig. 7.8: fig07_08.cpp
106// Cascading member function calls together
107// with the this pointer
108#include <iostream>
109
110using std::cout;
111using std::endl;
112
113#include "time6.h"
114
115int main()
116{
117    Time t;
118
119    t.setHour( 18 ).setMinute( 30 ).setSe
120    cout << "Military time: ";
121    t.printMilitary();
122    cout << "\nStandard time: ";
123    t.printStandard();
124
125    cout << "\n\nNew standard time: ";
126    t.setTime( 20, 20, 20 ).printStandard();
```

`printStandard` does not return a reference to an object.

Notice cascading function calls.

Cascading function calls. **`printStandard`** must be called after **`setTime`** because **`printStandard`** does not return a reference to an object.

`t.printStandard().setTime();` would cause an error.



Outline

```
127    cout << endl;
128
129    return 0;
130}
```

```
Military time: 18:30
Standard time: 6:30:22 PM

New standard time: 8:20:20 PM
```

Program Output