Classes Lecture 1 Sections 13.1 - 13.14

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Class Design

- Constructors and Destructors
- Inspectors and Mutators
- Operators and Facilitators

3 Member Access





Classes

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- Constructors and Destructors
- Inspectors and Mutators
- Operators and Facilitators

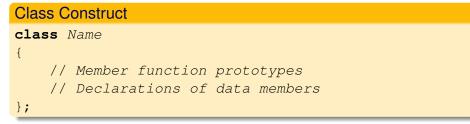
3 Member Access

4 Structs

5 Assignment

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• The class construct in C++ is an enhancement of the struct construct in C.

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The Class Point
class Point
{ public:
// Various member functions
private:
<pre>int m_x;</pre>
<pre>int m_y;</pre>
};

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- Members may be designated public, private, or protected.
- Members are *private* by default.
- Members may be objects or functions.

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- Many of the member functions of a class fall into one of the following categories.
 - Constructor
 - Destructor
 - Inspector
 - Mutator
 - Operator
 - Facilitator

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- A constructor creates a new object in a class.
- A destructor destroys an object.
- A class may have many constructors, but only one destructor.

Example (Point Class)

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- An inspector returns an attribute of an object.
- A mutator modifies an attribute of an object.
- Typically, the attributes involved are the data members.
- Typically, inspectors are **const** and take no parameters.
- Typically, mutators take one or more parameters and they return **void**.
- Whenever appropriate, the mutators should test the parameters for validity.

Example (Point Class)

int x() const {return m_x;}
void x(int x) {m_x = x;}

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- An operator is a function that is invoked by a symbol such as + or
 *.
- A facilitator is invoked by a non-member operator to perform the function of the operator.
- Nearly every class should have the following operators.
 - The assignment operator =.
 - The output operator <<.

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- It is always sensible to define the operators == and !=.
- It is not always sensible to define the operators <, >, <=, and >=.
- If there is a sensible meaning of <, then the other three can be defined as well.
- If < is undefined, then operations such as sorting are impossible.

- The output operator << can be very useful for debugging.
- The input and output operators >> and << should always be "compatible."
- That is, the input operator should be designed to read the same format that the output operator uses.
- The Point class outputs a point as (2, 3).

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Example (Point Class)

```
void output(ostream& out) const
{
    out << '(' << m_x << ", " << m_y << ')';
}
ostream& operator<<(ostream& out, const Point& p)
{
    p.output(out);
    return out;
}</pre>
```

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Member-Access Operators

Point p; cout << p.x() << ' ' << p.y(); p.x(5); p.y(6);

• Use the dot operator . to access members through an object.

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Struct Construct

struct Name

```
{
    // Declarations of data members
};
```

• C and C++ support the **struct** construct.

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The Struct Point	
struct Point	
{	
<pre>int m_x;</pre>	
<pre>int m_y;</pre>	
};	

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• In C:

- Struct members are public.
- Members may be objects, but not functions.
- In C++:
 - Struct members may be designated **public**, **private**, or **protected**.
 - Members are public by default.
 - Members may be objects or functions.

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Assignment

• Read Sections 13.1 - 13.14.

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