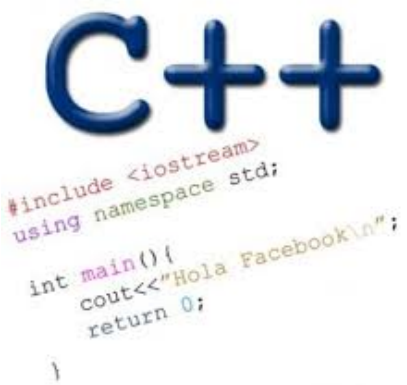
THE BIG FOUR
OPERATOR OVERLOADING
FRIEND FUNCTIONS

Problem Solving with Computers-II



Read the syllabus. Know what's required. Know how to get help.

CLICKERS OUT

How is h01 (specifically the CS16 final) going?

A. Done - I think I have done well

B. Attempted - found it a bit difficult

C. Attempted - found some concepts alien

D. Attempted - extremely difficult

E. Haven't attempted

Clickers out – frequency AC

The Big Four

1. Constructor
2. Destructor
3. Copy Constructor
4. Copy Assignment

Constructor and Destructor

Every class has the following special methods:

- Constructor: Called right AFTER new objects are created in memory
- Destructor: Called right BEFORE an object is deleted from memory

The compiler automatically generates default versions, but you can override them

Constructor (last class)

```
void foo(){
    Quadratic p;
    Quadratic* q = new Quadratic;
    Quadratic w(10, 5, 1);
}
```

How many times is the constructor called in the above code?

A. Never

B. Once

C. Twice

D. Thrice

Initialization lists

* Used to initialize member variables at the time they are created
* Must be used to initialize constant member variables

Destructor

- Must have the same name as the class preceded by a ~ (tilda)
- Does not have a return type
- Called right BEFORE an object is deleted from memory

Destructor

```
void foo(){
     Quadratic p;
     Quadratic *q = new Quadratic;
}
```

The destructor of which of the objects is called after foo() returns?

A. p
B. q
C. *q
D. None of the above

Copy constructor

- Creates a new object and initializes it using an existing object

Copy constructor

- In which of the following cases is the copy constructor called?

```
A. Quadratic p1; Quadratic p2(1, 2, 3);
B. Quadratic p1(1, 2, 3); Quadratic p2(p1);
C. Quadratic *p1 = new Quadratic(1, 2, 3);
   Quadratic p2 = *p1;
D. B&C
E. A, B & C
```

Copy assignment

- Default behavior: Copies the member variables of one object into another

```
Quadratic p1(1, 2, 3); // Parametrized constructor
Quadratic p2;
p2 = p1; // Copy assignment function is called
```

```
double foo(Quadratic p){
    return p.evaluate(10);
}
int main(){
     Quadratic q(1, 2, 3);
     foo(q);
     }
```

Which of the following special methods is called as a result of calling foo?

A. Parameterized constructor

B. Copy constructor

C. Copy Assignment

D. Destructor

Overloading Binary Comparison Operators

We would like to be able to compare two objects of the class using the following operators

==

!=

and possibly others

Overloading Binary Arithmetic Operators

We would like to be able to add two Quadratic expressions as follows

```
Quadratic p1, p2;
Quadratic p3 = p1 + p2
```

Overloading input/output stream

- Wouldn't it be convenient if we could do this:

```
Quadratic p(10, 10);
cout<<p;
```

And this….

Quadratic p;
cin>>p; //sets the coefficients of p based on user input

Friend functions

If a non-member function needs to access the PRIVATE members of a class, it should be declared as a friend function inside the class.

Example:
bool isEqual(Quadratic& p1, Quadratic& p2);

Returns True if p1 and p2 have the same coeffiecients, otherwise false

Summary

- Classes have member variables and member functions (method). An object is a variable where the data type is a class.
- You should know how to declare a new class type, how to implement its member functions, how to use the class type.
- Frequently, the member functions of an class type place information in the member variables, or use information that's already in the member variables.
- New functionality may be added using non-member functions, friend functions, and operator overloading

Next time

- Linked Lists