

## Objects and Classes

1-21-2001

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## Opening Discussion

- Do you have any questions about the quiz?
- Did anyone get anywhere with Connect-4?
- We actually wrote a class during the last class (conflicting terminology can be such a pain). What is a class? What are objects? What do we do with these things? How do they help us write better programs?

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## Object-Orientation

- Object-oriented programming is a paradigm of programming where we try to create constructs in the program that behave somewhat like real world objects.
- Encapsulation is the real key of OOP. This term encompasses the grouping together of data with the methods that operate on it as well as the ability to hide the implementation and separate it from the public interface.

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## Classes

- A class is a blueprint for building an object. It tells the program what properties and behaviors an object of that type should have.
- Classes defined in C++ become types, much like the primitive types built into the languages. They can hold data of different types like structs, but also give us the ability to group functionality as well.

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## Parts of a Class

- public, private, and protected
  - contents of classes can be given different levels of visibility. Protected is rarely used.
- Methods
  - These are the things that an object of a class can do. There are special methods called the constructor and destructor. Static methods don't use an object.
- Members
  - This is the data or state of the object.

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## Initializer Lists

- Constructors in C++ can be followed with initializer lists. These lists do just what their name says, they allow you to initialize the values in a class.
- These are mainly helpful when dealing with member classes where the classes need a non-default initial value. They are required if the member class has no public default constructor.

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## **explicit Constructors**

- Single argument constructors can be labeled as explicit. That means that they should only be used in an explicit constructor call.
- At first this might seem pointless, but by default C++ will use such constructors for type conversions and C++ put in a number of implicit type conversions.

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## **const Methods**

- If a method does not change the member data of a class then the method could be declared const. This is done by putting the const keyword after the end of the argument list outside the parentheses.
- Using const is not only a safe thing to do, but if an object is passed as a const argument to a function, only the const methods of that object can be called.

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## **Destructor**

- Classes can also have destructors. These are called whenever the object passes out of scope (for local variables) or when delete is called on it.
- The destructor is typically used to clean up memory that was allocated for the class.
- By default the destructor does nothing.

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## Copy Constructor

- A constructor that takes a single argument of that class is called a copy constructor. It is used to create copies of that class, in some places implicitly.
- This is one place where you would implement a deep copy if your class has pointers in it.
- The default behavior is a straight memory copy (a shallow copy).

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## operator=

- The other place where you would want to implement a deep copy is in the operator= method.
- This case is more obvious though as the assignment operator is obviously going to create a copy of something.
- This also has a default behavior of a shallow copy.

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## Minute Essay

- Next class we will look more closely at the details of using classes. Do you feel secure with writing a class and declaring instances of it? This is going to be very important in this course so you should tell me any question you have regarding it.
- There is a TopCoder tournament tonight if you are so inclined.

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