CGT 215 Lecture 3 Introduction to Classes and Objects

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Car analogy

□ Somebody tell me about the car analogy...

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Car analogy

- □ Suppose you want to drive a car and make it go faster by pressing on the gas pedal.
- □ What must happen before you can do this?
- ☐ Before you can drive it, somebody had to design it.
- □ Designing a car typically begins with engineering drawings, or blueprints for 'how' to make a car.

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Car analogy

- ☐ The blueprints include the design for the gas pedal, as well as the brake pedal.
- ☐ The gas pedal "hides" the complex mechanisms that actually make the car go faster.
- ☐ The brake pedal "hides" the mechanisms that make the car slow down.
- ☐ The steering wheel "hides" the mechanisms that make the car turn left and right.

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Car analogy

- ☐ This enables people with little or no knowledge of how engines work to be able to drive a car.
- □ However, you can't drive the blueprints you have to build a car first.

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Method

- □ Actions
- $\ \square$ A method has () after the method name
- □ *Performing a task* in an application requires a method. The *method* describes the mechanisms that actually perform its tasks.
- ☐ The method hides from its user the complex tasks that it performs just as a gas pedal would hide the tasks for making a car go faster.

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Class

- □ In C#, we begin by creating an application unit called a *class* to house (among other things) a method just as a car's blueprints house (among other things) the design of the gas pedal.
- ☐ In a class, you provide methods to perform the class's tasks.
- □ GoFaster() and SlowDown() might be methods of a car class.

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Object

- □ Just as you cannot drive a blueprint of a car, you cannot "drive" a class.
- □ Just as you must build a car first, then drive it
 you must build an *object* of the class before you can get an application to perform the tasks that the class describes.

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Objects

- □ Briefly Defined
 - An object groups related methods, attributes, & properties
 - Reusable software components
 - A building block for you to use & reuse
 - Typically models something in the real world

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Attributes

- □ A car has many *attributes* as well, such as its color, make, model, number of doors, amount of gas in the tank, current speed, and total miles driven (to name a few)
- ☐ These attributes are also a part of the car's design plans / blueprint and always travel with the car as long as it exists.
- □ Every car maintains is own attributes

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Attributes

- □ Every car maintains is own attributes
- ☐ For example, each car knows how much gas is in its own tank, but not how much is in the tanks of other cars.
- ☐ The same is true for each object you create from a class.
- ☐ These attributes are specified as part of the class.

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Properties

- □ Notice that these attributes are not necessarily accessible directly.
- ☐ You don't climb under a car, un-mount the gas tank, and look inside it to see if it's full. You use the gas gauge on the dashboard.
- □ *Properties* are get and set accessors for reading and setting attributes.

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Properties get accessors For reading the values of variables (attributes) set accessors For storing values into variables (attributes) GetCruiseSpeed(); SetCruiseSpeed(); Cor 215 Copyright © 2008 Reveald J. Glotzhach

Instance Variables

- □ When you build a car, you are building an *instance* of that car. There may be 20,000 Ford Fusion cars on the road, but you only have an *instance* of that car.
- □ When you create an object from a class, it is called an *instance variable*
- □ This process is called: *instantiating an instance of an object*

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Method Call

- □ When you drive a car, pressing the gas pedal sends a message to the car to perform a task make the car go faster.
- ☐ Similarly, you send messages to an object each message is known as a *method call* and tells a method of the object to perform a task.
- ☐ GoFaster(); //a method call
- □ SlowDown(); //a method call

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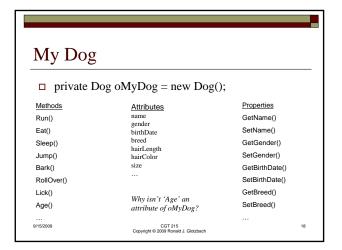
Methods & Attributes

- □ Generally, () signifies a method
 - () distinguishes a method from an attribute
- □ Conversely:
 - An attribute is set with a value
 - \square x = 15;
 - □ isCorrect = true;
 - □ name = "Deitel";
 - No code is executed other than the assignment of the value to the attribute

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My Dog Methods Attributes Properties 915/2009 CGT 215 Copyright © 2009 Ronald J. Glotzbach 17



private Person myDad = new Person();
private Person myMom = new Person();

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Instantiation vs. Initialization

☐ *Instantiation* creates an instance of an object, as in the previous slide

□ Initialization

- Assigning a value to a variable
 - □ name = "Deitel";
 - \square x = 1;
 - □ isCorrect = false;

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Access M	odifiers	
□ private		
protected		
public		
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Access Modifiers: private

- □ A class's *private* variables and methods are not directly accessible to the class's clients. They are not accessible outside the class.
- □ Another way to say it: Variables, properties, and methods declared with access modifier *private* are accessible only to properties and methods of the class in which they are declared.
- private int x;

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Access Modifiers: public

- ☐ The primary purpose of a *public* method is to present to the class's clients a view of the services the class provides (the class's public interface).
- □ Clients of the class need not be concerned with how the class accomplishes its tasks.
- public members are accessible wherever the application has a reference to an object of that class or one of its derived classes.
- public string name;

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Access Modifiers (cont.)

- □ Note that members of a class for instance, methods and instance variables do not need to be explicitly declared *private*.
- ☐ If a class member is not declared with and access modifier, it has *private* access by default.
- □ int y; //automatically declared private

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Software Engineering Observation 4.2

- □ Precede every field and method declaration with an access modifier.
- ☐ Generally, instance variables should be declared private and methods and properties should be declared public.
- ☐ If the access modifier is omitted before a member of a class, the member is implicitly declared private.

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Access Modifiers: protected

- □ Using *protected* access offers an intermediate level of access between *public* and *private*.
- □ A base class's *protected* members can be accessed by members of that base class *and* by members of it's derived classes.
- □ We'll discuss this more when we learn about inheritance.
- □ protected string gender;

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Demo

- □ Create Dog class
 - Methods, attributes, property accessors
- □ Instantiate multiple dogs
- Make method calls
- □ Change attributes
- □ Change access modifiers

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