

Object – Oriented  
Concepts & Principles

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Classes

- Object-oriented thinking begins with the definition of a class
- A class is a generalized description (e.g., a template, pattern, or blueprint) that describes a collection of similar objects
- A metaclass (also called a superclass) is a collection of classes
- A subclass is a specialized instance of a class

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Two representations of a class

The diagram illustrates two ways to represent a class. On the left is a rectangular box divided into three sections: 'class name' at the top, 'attributes:' in the middle (represented by a 3x3 grid of squares), and 'operations:' at the bottom (represented by three overlapping rectangles). On the right is a circular diagram divided into two main sections: 'operations' at the top and 'attributes:' in the center (represented by a 3x3 grid of squares). The bottom half of the circle is shaded gray.

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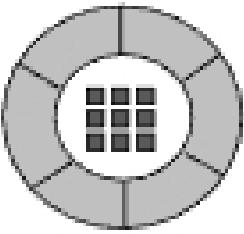
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### Operations (or Methods or Services)

An executable procedure that is encapsulated in a class and is designed to operate on one or more data attributes that are defined as part of the class.  
 A method is invoked via message passing.



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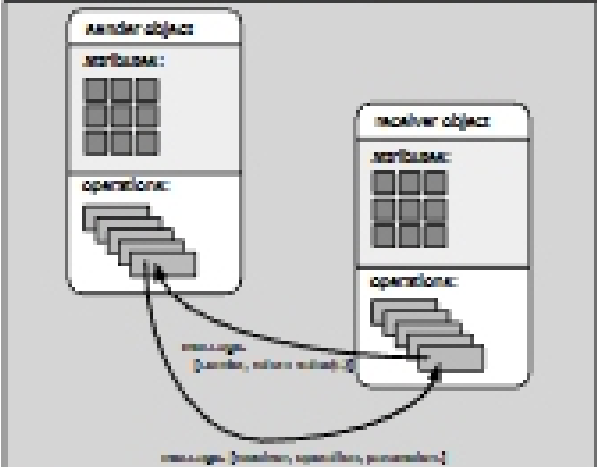
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### Messages

Messages - the means by which objects exchange information with one another



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### Characteristics of OO systems

- Three characteristics of object-oriented systems make them unique:
  - Encapsulation
  - Inheritance
  - Polymorphism

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### Encapsulation

**Object, chair**

Seat  
Dimensions  
Weight  
Location  
Color

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Leg  
Roll  
Weight  
Material

The object **chair** (and all objects in general) encapsulates

data (the attribute values that define the chair)

operations (the actions that change the attributes of chair)

other objects (composite objects can be defined (EVB89))  
constants (set values), & other related information.

Encapsulation means that all of this information is packaged under one name and can be reused.

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### Encapsulation / Information hiding

The object encapsulates both data and operations required to manipulate the data

Achieves "information hiding"

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### Inheritance from class to object

**Class, Furniture**

Seat  
Dimensions  
Weight  
Location  
Color

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Leg  
Roll  
Weight  
Material

The object inherits all attributes and operations of the class

**Object, chair**

Seat  
Dimensions  
Weight  
Location  
Color

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Leg  
Roll  
Weight  
Material

**Chair** is a member (instance) of a class of objects called **furniture**.

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