A201 Object Oriented Programming with Visual Basic .Net

By:

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What do we need to learn in order to write computer programs?

- Fundamental programming constructs:
  - Variables,
  - Arithmetic operators,
  - Input and output
  - Conditionals,
  - Loops,
  - Procedures and functions,
  - Arrays (Multi-Dimensional Arrays),
  - Structures, More on classes and objects,
  - Files
Access Modifiers:

- Class properties and methods are preceded with ‘Access Modifiers’.

- **Public:**
  - Make the property or behavior accessible to the outside clients.

- **Private:**
  - Make the property or behavior usable by the class methods only.
Access Modifiers:

' Declare a new object of type student
Dim MyStudent As New Student

Public Class Student

    Public Name As String
    Public Email As String
    Private Password As String

    'set the private data of a given object
    Public Sub setPassword(ByVal ThePassword As String)
        Password = ThePassword
    End Sub

    'return the private data from the object
    Public Function getPassword() As String
        Return (Password)
    End Function

End Class

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What is a Constructor?

- A constructor is a method that is called when a new object is instantiated. The job of the constructor is to setup the initial state of the object. (e.g. initialize the class variables etc.)

- Visual Basic will automatically create a empty constructor for each class. However the user can create her own constructor.

- The method name of the constructor is “New()”

- **Example:**

  ' Constructor for this class will be called whenever 
  ' a new object is instantiated.

  Public Sub New()
      Name = "No Name"
      Email = "No Email"
      Password = "No Password"
  End Sub
Class with a user-defined Constructor:

Public Class Student

    Public Name As String
    Public Email As String
    Private Password As String

    'set the private data of a given object
    Public Sub setPassword(ByVal ThePassword As String)
        Password = ThePassword
    End Sub

    'return the private data from the object
    Public Function getPassword() As String
        Return (Password)
    End Function

    ' Constructor for this class will be called whenever
    ' a new object is instantiated.
    Public Sub New()
        Name = "No Name"
        Email = "No Email"
        Password = "No Password"
    End Sub

End Class

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Polymorphism

- Polymorphism comes form the Greek: "having many shapes".
Polymorphism

- Two methods for achieving Polymorphism:
  - Overloading
  - Overriding
Overloading

☐ Ability to take many shapes or forms.

☐ In Object Oriented Programming, polymorphism refers to methods that have identical names but have different implementations depending on their parameters.

☐ A single class can have more that one method with the same name. This is called OVERLOADING.
Example of Overloading

- The example below shows two methods for setting the password property of the student class.

' set the “Password” to a value passed to the method
Public Sub setPassword(ByVal ThePassword As String)
    Password = ThePassword
End Sub

' set the “Password” to a default value (No parameters!!)
Public Sub setPassword()
    Password = "Default"
End Sub
Complete Example:

Public Class Student
    Public Name As String
    Public Email As String
    Private Password As String

    '----------------------------------------
    Public Sub setPassword(ByVal ThePassword As String)
        Password = ThePassword
    End Sub

    Public Sub setPassword()
        Password = "Default"
    End Sub

    'return the private data from the object
    Public Function getPassword() As String
        Return (Password)
    End Function

    '----------------------------------------
    Public Sub New()
        Name = "No Name"
        Email = "No Email"
        Password = "No Password"
    End Sub

    Public Sub New(ByVal TheName As String, ByVal TheEmail As String)
        Name = TheName
        Email = TheEmail
        Password = "*****"
    End Sub

End Class

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Instantiating and Using Overloaded Methods:

Public Class Student

    Public Name As String
    Public Email As String
    Private Password As String

    dimension() '-----------------------------
    Public Sub setPassword(ByVal ThePassword As String)
        Password = ThePassword
    End Sub

    Public Sub setPassword()
        Password = "Default"
    End Sub

    'return the private data from the object
    Public Function getPassword() As String
        Return (Password)
    End Function

    dimension() '-----------------------------
    Public Sub New()
        Name = "No Name"
        Email = "No Email"
        Password = "No Password"
    End Sub

    Public Sub New(ByVal TheName As String, ByVal TheEmail As String)
        Name = TheName
        Email = TheEmail
        Password = "*****"
    End Sub

End Class

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Overriding

- Overriding is similar to Overloading, however overriding applies in the inherited classes.
- Refers to methods that have the same name as a method in its BASE CLASS.
- The method in the subclass or derived class takes precedence, or overrides the identically named method in the base class.
Example of Overriding

Base Class

Student

Derived Class

GradStudent

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Example of Overriding

Base Class
Student

Public **Overridable** Sub PrintName()
    Console.WriteLine("Student: {0,-20}", Name)
End Sub

Derived Class
GradStudent

**Overrides** Sub PrintName()
    Console.WriteLine("GradStudent: {0,20}", Name)
End Sub

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Complete Example:

Public Class Student

    Public Name As String
    Public Email As String
    Private Password As String

    'set the private data of a given object
    Public Sub setPassword(ByVal ThePassword As String)
        Password = ThePassword
    End Sub

    'Overloaded Method, set the private to a default value
    Public Sub setPassword()
        Password = "Default"
    End Sub

    'return the private data from the object
    Public Function getPassword() As String
        Return (Password)
    End Function

    ' Constructor for this class will be called whenever
    ' a new object is instantiated.
    Public Sub New()
        Name = "No Name"
        Email = "No Email"
        Password = "No Password"
    End Sub

    ' Overloaded Constructor
    Public Sub New(ByVal TheName As String, ByVal TheEmail As String)
        Name = TheName
        Email = TheEmail
        Password = "*******"
    End Sub

    ' To be overridden by a methods in a derived class
    Public Overridable Sub PrintName()
        Console.WriteLine("Student: {0,-20}", Name)
    End Sub

End Class

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Complete Example:

Public Class GradStudent
    Inherits Student

    Public ThesisTopic As String
    Public ThesisAdvisor As String

    Public Sub New()
        MyBase.New()
        ThesisTopic = "Unknown"
        ThesisAdvisor = "Graduate Director"
    End Sub

    Public Sub New(ByVal TheName As String, ByVal TheEmail As String,
                    ByVal TheTopic As String, ByVal TheAdvisor As String)
        MyBase.New(TheName, TheEmail)
        ThesisTopic = TheTopic
        ThesisAdvisor = TheAdvisor
    End Sub

    ' Override the PrintName() method in the base class
    Overrides Sub PrintName()
        Console.WriteLine("GradStudent: {0,20}", Name)
    End Sub

End Class
Instantiating and Using Overridden Methods:

- Create a new graduate student object:
  
  Dim A_Graduate_Student As New GradStudent

- Call the PrintName() method:
  
  A_Graduate_Student.PrintName()

- Which PrintName() method gets called? The one in the base class or the one in the subclass?

- What if the subclass did not override the PrintName() method? Which method would get the call?