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**CSC253 ADVANCED C# ProGRAMMING**

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LAB 05 **CLASSES AND OBJECTS: A DEEPER LOOK**

# Objectives

In this lab assignment, students will learn:

* To use the this keyword to refer to the object itself
* To write multiple constructors for a class
* To create and use static class members
* To use object initializers

# Goals

In this lab assignment, students will demonstrate the abilities to:

* Use the this keyword to refer to the object itself
* Write multiple constructors for a class
* Create and use static class members
* Use object initializers

# Description

Create a C# console application for each question. When you create a new C# project, Visual Studio creates a folder to hold every file and sub-folder for your project. You need to zip this folder and submit the zip file to Blackboard.

1. The following program defines class Weight. This class has two public instance variables pound and ounce. It also has a constructor that tries to initialize these two instance variables.

using System;

public class Weight

{

public int pound;

public int ounce;

public Weight(int pound, int ounce)

{

pound = pound;

ounce = ounce;

}

}

public class WeightTest

{

static void Main(string[] args)

{

Weight weight1 = new Weight(5, 14);

Console.WriteLine($"Weight 1: {weight1.pound} lb. {weight1.ounce} oz.");

}

}

However, something is wrong with the program. The instance variables are not initialized properly by the constructor. Output of the program above:

Weight 1: 0 lb. 0 oz.

Press any key to continue . . .

Please fix the program by adding the keyword this in proper places in the constructor. Although there are other ways to fix the program, you are required to solve it by adding the keyword this.

The following is the expected output after the modifications.

Weight 1: 5 lb. 14 oz.

Press any key to continue . . .

2. Create class Height. This class has two private instance variables foot and inch (integers). Create public properties for these two instance variables. Each property has a getter and setter. The instance variable foot should be 0 or larger, while the instance variable inch should be between 0 and 11, inclusive. Throw an ArgumentOutOfRangeException if an out of range value is trying to be stored in these instance variables.

Write constructors for this class. These constructors can handle a few different situations:

1. If two arguments are passed in, the first one will be foot while the second one will be inch.
2. If one argument is passed in, it will be foot. Set inch to 0.
3. If no arguments are passed in, set both foot and inch to 0.
4. If another Height object is passed in, copy the values of its foot and inch.

Use the following code to test your class Height.

public class HeightTest

{

static void Main(string[] args)

{

Height h1 = new Height(5, 7);

Console.WriteLine($"h1: {h1.Foot} ft. {h1.Inch} in.");

Height h2 = new Height(5);

Console.WriteLine($"h2: {h2.Foot} ft. {h2.Inch} in.");

Height h3 = new Height();

Console.WriteLine($"h3: {h3.Foot} ft. {h3.Inch} in.");

Height h4 = new Height(h1);

Console.WriteLine($"h4: {h4.Foot} ft. {h4.Inch} in.");

try

{

Height h5 = new Height(-5, 7);

Console.WriteLine($"h5: {h5.Foot} ft. {h5.Inch} in.");

}

catch (ArgumentOutOfRangeException ex)

{

Console.WriteLine("\nException while initializing h5: ");

Console.WriteLine(ex.Message);

}

try

{

Height h6 = new Height(5, -7);

Console.WriteLine($"h6: {h6.Foot} ft. {h6.Inch} in.");

}

catch (ArgumentOutOfRangeException ex)

{

Console.WriteLine("\nException while initializing h6: ");

Console.WriteLine(ex.Message);

}

}

}

The following is the expected output.

h1: 5 ft. 7 in.

h2: 5 ft. 0 in.

h3: 0 ft. 0 in.

h4: 5 ft. 7 in.

Exception while initializing h5:

Foot must be 0 or larger

Parameter name: value

Actual value was -5.

Exception while initializing h6:

Inch must be 0-11

Parameter name: value

Actual value was -7.

Press any key to continue . . .

3. Create class Student. This class has two private instance variables, name and id, to store the student’s name and ID. Create a constructor that takes a string as an argument. This string will be stored as the student’s name. The program will automatically generate a 4-digit ID for every new student. The first student will get ID number 1001, the second one will get 1002, and so on. Also write a DisplayInfo method to display the ID and name of the student.

Use the following code to test your Student class.

class StudentTest

{

static void Main(string[] args)

{

Student student1 = new Student("Amy Lee");

Student student2 = new Student("John Williams");

student1.DisplayInfo();

student2.DisplayInfo();

}

}

Your should get the following output:

ID: 1001 Name: Amy Lee

ID: 1002 Name: John Williams

4. Create class Course. Add two self-implemented properties CourseName and Instructor. Create a publicly accessible method DisplayInfo to display data stored in these two properties. Do not write any constructors. We will use an object initializer to initialize the properties when a Course object is instantiated.

Write a test program to test this class. Create two instances of Course: csc153 and csc152. Use object initializers to initialize CourseName and Instructor when these two courses are created. For csc153, initialize CourseName to Intro C# and Instructor to Leung. For csc152, initialize CourseName to SAS and Instructor to Orazem. Also write statements to invoke the DisplayInfo method for both courses.

Your should get the following output:

Course: Intro C# Instructor: Leung

Course: SAS Instructor: Orazem

# Grading rubricS

Program 1:

Correcting problems in the program [10 pts]

Program 2:

Instance variables [5 pts]

Constructors [20 pts]

Properties [20 pts]

Program 3:

Instance variables [5 pts]

Constructor [5 pts]

Generate student ID [10 pts]

Display student info [5 pts]

Program 4:

Class Course [10 pts]

Test program for Course [10 pts]