# Department of Computing

# CS 212: Object Oriented Programming

# Lab 06: Polymorphism

# Date: 18-03-2024

# Time: 9:00pm- 12:00 pm

# Instructor: Mr. Jaudat Mamoon

**Lab Engineer: Engr. Masabah Bint E Islam**

**Lab Tasks**

Reference Book: Java How to Program, 10th Ed, Deitel & Deitel (Available on LMS)

**Task# 1:**

Write an abstract class LivingThing.java followed by two concrete classes, Human.java and Monkey.java, extending the abstract class.

Diagram

Description automatically generated

Once done defining classes use the following client class to test it.

package myabstractclassproject**;**

public class Main **{**

public static void main**(** String**[]** args**)** **{**

// Create Human object instance

// and assign it to Human type.

Human human1 **=** **new** Human**(** "Will Rodman"**);**

human1**.**walk**();**

// Create Human object instance

// and assign it to LivingThing type.

LivingThing livingthing1 **=** human1**;**

livingthing1**.**walk**();**

// Create a Monkey object instance

// and assign it to LivingThing type.

LivingThing livingthing2 **=** **new** Monkey**(** "Caesar"**);**

livingthing2**.**walk**();**

// Display data from human1 and livingthing1.

// Observe that they refer to the same object instance.

System**.**out**.**println**(** "human1.getName() = " **+** human1**.**getName**());**

System**.**out**.**println**(** "livingthing1.getName() = " **+** livingthing1**.**getName**());**

// Check of object instance that is referred by x and

// y is the same object instance.

boolean b1 **=** **(** human1 **==** livingthing1**);**

System**.**out**.**println**(** "Do human1 and livingthing1 point to the same object instance? " **+** b1**);**

**}**

**}**

Running the test should result in the following output.

Human Will Rodman walks...

Human Will Rodman walks...

Monkey Caesar also walks...

human1.getName() = Will Rodman

livingthing1.getName() = Will Rodman

Do human1 and livingthing1 point to the same object instance? true

**Bonus.** What happens when you create a LivingThing object in the Main class? For example using the statement,

LivingThing z = new LivingThing();

**Task# 2:**

Your task is to write MyOnlineShop program by referring to the UML class diagram below.

**Diagram

Description automatically generated**

Once done with the class definitions use the following tester class to confirm its working.

|  |
| --- |
| package myonlineshop**;**  public class Main **{**    public static void main**(**String**[]** args**)** **{**    // Declare and create Product array of size 5  Product**[]** pa **=** **new** Product**[**5**];**    // Create object instances and assign them to  // the type of Product.  pa**[**0**]** **=** **new** TV**(** 1000**,** "Samsung"**,** 30**);**  pa**[**1**]** **=** **new** TV**(** 2000**,** "Sony"**,** 50**);**  pa**[**2**]** **=** **new** MP3Player**(** 250**,** "Apple"**,** "blue"**);**  pa**[**3**]** **=** **new** Book**(** 34**,** "Sun press"**,** 1992**);**  pa**[**4**]** **=** **new** Book**(** 15**,** "Korea press"**,** 1986**);**    // Compute total regular price and total  // sale price.  double totalRegularPrice **=** 0**;**  double totalSalePrice **=** 0**;**    **for** **(**int i**=**0**;** i**<**pa**.**length**;** i**++){**    // Call a method of the super class to get  // the regular price.  totalRegularPrice **+=** pa**[**i**].**getRegularPrice**();**    // Since the sale price is computed differently  // depending on the product type, overriding (implementation)  // method of the object instance of the sub-class  // gets invoked. This is runtime polymorphic  // behavior.  totalSalePrice **+=** pa**[**i**].**computeSalePrice**();**    System**.**out**.**println**(**"Item number " **+** i **+**  ": Type = " **+** pa**[**i**].**getClass**().**getName**()** **+**  ", Regular price = " **+** pa**[**i**].**getRegularPrice**()** **+**  ", Sale price = " **+** pa**[**i**].**computeSalePrice**());**  **}**    System**.**out**.**println**(**"totalRegularPrice = " **+** totalRegularPrice**);**  System**.**out**.**println**(**"totalSalePrice = " **+** totalSalePrice**);**  **}**  **}** |

Item number 0: Type = myonlineshop.TV, Regular price = 1000.0, Sale price = 800.0

Item number 1: Type = myonlineshop.TV, Regular price = 2000.0, Sale price = 1600.0

Item number 2: Type = myonlineshop.MP3Player, Regular price = 250.0, Sale price = 225.0

Item number 3: Type = myonlineshop.Book, Regular price = 34.0, Sale price = 17.0

Item number 4: Type = myonlineshop.Book, Regular price = 15.0, Sale price = 7.5

totalRegularPrice = 3299.0

totalSalePrice = 2649.5