

CO2220 Laboratory 5  
Graphical Object-Oriented and Internet Programming in Java

Corresponds to Vol 1, Chapter 8 (Inheritance) and 9 (Abstraction) of Study Guide

Learning Objectives:

To understand and apply the following concepts:

- How abstract classes work
- How the keyword "implements" is used

**Task 1**

We are on the Seabird Colony Island and we saw the characters Dale and Yale ahead. In this task we should write a `Character` superclass for these characters and a `greet` for them to interact.

- a) Write a class named **Character**. Write a **`greet()`** method with a method signature shown below. The method should display the message "I am a generic Character." concatenated with `str` as a message.

```
protected void greet (String str)
```

- b) Write a class **Dale** as a subclass of `Character`. Include a **`greet()`** method with a method signature shown below. The method should display the message "I am a Dale." concatenated with `str` as a message.

```
public void greet (String str)
```

- c) Write a class **Yale** as a subclass of `Character`. Include the **`greet()`** method such that the message "I am Yale. Good to see you!" concatenated with `str` will be displayed as a message.

- d) Write a class `SeabirdColony` with `public static void main()`. Declare a variable `var` with the type `Character`. Using this variable, demonstrate polymorphism by creating objects with classes `Dale` and `Yale`.

- e) Use the objects created in previous parts to display messages with their **`greet()`** method. Is there any problems raised by the compiler?

Declare class `Character` as an abstract class. What other changes should you make to your current program so that it can compile successfully? Discuss how the correct behaviour will be presented depending on the actual `Character` object.

Hint:

```
public abstract class Character
{
    abstract void greet (String str);
}
```

- f) Write another **greet()** method for the class **Yale**. Let this method accept an argument of the type **Object** instead of **String**. Let this method show the message, "I am a Yale." concatenated with **str**.

Put this method before the **greet** method that you wrote in part c. Class **Yale** has two **greet()** methods. The first takes in an **Object** as argument. The second takes in a **String** as argument.

Can both **greet()** methods be selected when you execute the statement below?

```
aYale.greet("Greetings!");
```

// where aYale is a Yale object.

Run the program to find out which of the two **greet()** methods run. Discuss what you have learnt from this.

Hint:

Consider casting the string into an object, e.g., `aYale.greet( (Object) "My greetings to you!");`

- g) Write an interface **GreetInterface** with a **greet()** method with a single string argument. Let it display a simple message "Hello Hello." Does the compiler allow you to do this?

Ans: No, all interface method cannot have body. Make changes so that it is permissible by the compiler.

Hint: Remove the method body.

```
public interface GreetInterface
{
    public abstract void greet (String str);
}
```

- h) Modify the class `Yale` such that it implements `GreetInterface`. What modifications are needed for this to be successful?

Tip:

```
public class Yale extends Character implements GreetInterface
{
    public void greet (Object str)
    {
        System.out.println ("Object ... I am a Yale");
    }

    public void greet (String str)
    {
        System.out.println ("I am a Yale.");
    }
}
```

## Task 2

Learning Objectives:

To understand the use of enhanced `for` loop.

Write a program that will do the following:

- a) Declare and create an array of the type `String` with a size of 50.
- b) Assign, the first few elements of the array, values such as "GERMANY", "RUSSIA", "JAPAN", "KOREA", "UNITEDSTATESOFAMERICA" and "AUSTRIA".
- c) Use the enhanced `for` loop to examine each string in the array
- d) Stop the looping if the string "AUSTRIA" is encountered in the array
- e) Display all the strings that are longer than 5 characters in length
- f) Test your program with and without the string "AUSTRIA" in the array. What happens if "AUSTRIA" is not in the array? Can you explain why?

### Task 3

#### Learning Objectives:

To have a better understanding of how abstract classes work and how the keyword “implements” is used through a study of the java examples provided in the course guide (package abstractclassesandinterfaces).

Read through the java files in this package. They include the following:

- App.java
- Drawable.java
- Message.java
- Movable.java
- MovingPolygon.java
- Polygon.java
- Shape.java

(a) Run App

What is your observation?

(b) Shape implements **Drawable**. Can we supply an implementation of draw method inside the Shape class?

(c) Where should the draw method be implemented?

(d) Modify the program to have a moving polygon with 3 vertices.

(e) Modify the program such that the moving polygon has color changing effects continuously.