

National University

Faculty of Computer Science and
Technology

Object Oriented Programming
Lec (5)

Introduction to Classes,
Objects

Declaring a Class with a Method and Instantiating an Object of a Class

- Create a new class (GradeBook)
- Use it to create an object.
- Each class declaration that begins with keyword `public` must be stored in a file that has the same name as the class and ends with the `.java` file-name extension.
- Keyword `public` is an access modifier.
 - Indicates that the class is “available to the public”

```
1 // Fig. 3.1: GradeBook.java
2 // Class declaration with one method.
3
4 public class GradeBook
5 {
6     // display a welcome message to the GradeBook user
7     public void displayMessage()
8     {
9         System.out.println( "Welcome to the Grade Book!" );
10    } // end method displayMessage
11 } // end class GradeBook
```

Fig. 3.1 | Class declaration with one method.

- The main method is called automatically by the Java Virtual Machine (JVM) when you execute an application.
- Normally, you must call methods explicitly to tell them to perform their tasks.
- A public is “available to the public”
 - It can be called from methods of other classes.
- The return type specifies the type of data the method returns after performing its task.
- Return type void indicates that a method will perform a task but will not return (i.e., give back) any information to its calling method when it completes its task.

- Method name follows the return type.
- Method names begin with a lowercase first letter and subsequent words in the name begin with a capital letter.
- Empty parentheses after the method name indicate that the method does not require additional information to perform its task.
- Together, everything in the first line of the method is typically called the Method header
- Every method's body is delimited by left and right braces.
- The method body contains one or more statements that perform the method's task.

- Use class GradeBook in an application.
- Class GradeBook is not an application because it does not contain main.
- Can't execute GradeBook; will receive an error message like:
 - Exception in thread "main"
 - java.lang.NoSuchMethodError: main
- Must either declare a separate class that contains a main method or place a main method in class GradeBook.
- To help you prepare for the larger programs, use a separate class containing method main to test each new class.
- Some programmers refer to such a class as a driver class.

```
1 // Fig. 3.2: GradeBookTest.java
2 // Creating a GradeBook object and calling its displayMessage method.
3
4 public class GradeBookTest
5 {
6     // main method begins program execution
7     public static void main( String[] args )
8     {
9         // create a GradeBook object and assign it to myGradeBook
10        GradeBook myGradeBook = new GradeBook();
11
12        // call myGradeBook's displayMessage method
13        myGradeBook.displayMessage();
14    } // end main
15 } // end class GradeBookTest
```

Welcome to the Grade Book!

Fig. 3.2 | Creating a GradeBook object and calling its displayMessage method.

- A static method (such as main) is special
- It can be called without first creating an object of the class in which the method is declared.
- Typically, you cannot call a method that belongs to another class until you create an object of that class.
- Declare a variable of the class type.
- Each new class you create becomes a new type that can be used to declare variables and create objects.
- You can declare new class types as needed; this is one reason why Java is known as an extensible language.

➤ Class instance creation expression

- Keyword `new` creates a new object of the class specified to the right of the keyword.
- Used to initialize a variable of a class type.
- The parentheses to the right of the class name are required.
- Parentheses in combination with a class name represent a call to a constructor, which is similar to a method but is used only at the time an object is created to initialize the object's data.

- Call a method via the class-type variable
 - Variable name followed by a dot separator(.), the method name and parentheses.
 - Call causes the method to perform its task.
- Any class can contain a main method.
 - The JVM invokes the main method only in the class used to execute the application.
 - If multiple classes that contain main, then one that is invoked is the one in the class named in the java command.

- Figure 3.3: UML class diagram for class GradeBook.
- Each class is modeled in a class diagram as a rectangle with three compartments.
 - Top: contains the class name centered horizontally in boldface type.
 - Middle: contains the class's attributes, which correspond to instance variables.
 - Bottom: contains the class's operations, which correspond to methods.
- Operations are modeled by listing the operation name preceded by an access modifier (in this case +) and followed by a set of parentheses.
- The plus sign (+) corresponds to the keyword public.

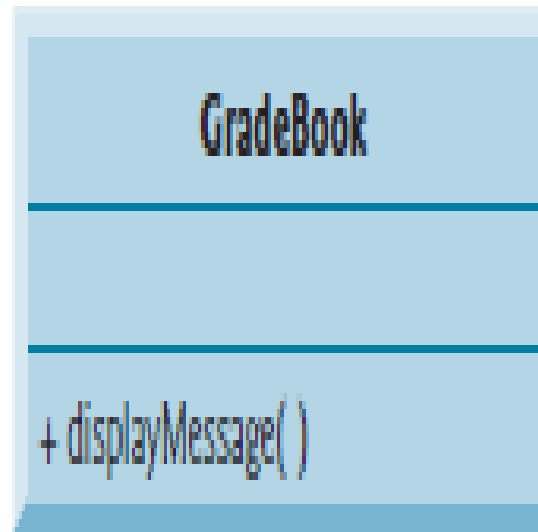


Fig. 3.3 | UML class diagram indicating that class `GradeBook` has a public `displayMessage` operation.