Create Custom Functions and Methods

Estimated time needed: 30 minutes

In this lab, you will learn how to create methods and functions in a class.

You are currently viewing this lab in a Cloud based Integrated Development Environment (Cloud IDE). It is a fully-online integrated development environment that is pre-installed with JDK 21, allowing you to code, develop, and learn in one location.

Learning Objectives

After completing this lab, you will be able to:

- Create a class with methods
- Provide different levels of access to the methods
- Handle errors that are anticipated within the method
- Invoke the methods passing the parameters
- Store the return value and print it out in the requested format

Creating a custom function

When creating a custom function for a class, it is important to decide on whether the function has to be `static` or not. A `static` method, doesn't require an object of the class to be created. An example for a method which can be `static` is a method which returns the pi value. They're associated with the class itself, not with objects of the class.

1. Create a project directory by running the following command.

   ```
   mkdir my_custom_method_proj
   ```

2. Run the following code to create the directory structure.

   ```
   mkdir -p my_custom_method_proj/src
   mkdir -p my_custom_method_proj/classes
   mkdir -p my_custom_method_proj/test
   cd my_custom_method_proj
   ```

3. Now create a file named `AreaCalculator.java` inside the src directory.

```
touch /home/project/my_custom_method_proj/src/AreaCalculator.java
```

4. Click the following button to open the file for editing.

Open **AreaCalculator.java** in IDE

5. Create the skeleton structure for the AreaCalculator program. Paste the following content in `AreaCalculator.java`.

```
//import Scanner to read user input
import java.util.Scanner;
public class AreaCalculator {
    //Add the methods to calculate area here
    public static void main(String s[]){
        System.out.println("Welcome to the area calculator!");
        while(true) {
            //Add the menu to get user input and invoke method here
        }
    }
}
```

6. You will now add the methods that you want to include in an AreaCalculator to calculate the area of basic shapes such as circle, square and rectangle.

- `circle` - You will need the radius of the circle to calculate the area. The area can be calculated using the formula (pi.r^2) where r is the radius that needs to be provided as a parameter to the function.
- `square` - You will need the length or breadth of the square to calculate the area. The area can be calculated using the formula (length.length) or (breadth.breadth). In the case of a square, both are the same and that needs to be provided as a parameter to the function.
- `rectangle` - You will need the the length and breadth of the rectangle to calculate the area. The area can be calculated using the formula (length.breadth). Both length and breadth need to be provided as parameters to the function.

Paste the following content in `AreaCalculator.java` inside the class, before the main method.

```
private static float pi = 3.142f;
private static float circle(float radius) {
    return (pi * radius * radius);
}
private static float square(float length) {
    return length * length;
}
private static float rectangle(float length, float breadth) {
    return length * breadth;
}
```

As you may notice, the methods are `private`, meaning that the method can only be called within the class, and `static`, meaning you don't have to create an instance of the class to invoke the method and all the methods return a float, meaning the return value can have decimal place.

Paste the following content in `AreaCalculator.java` inside the `main` method.

```
System.out.println("\nEnter 1 for circle\n" +
                   "Enter 2 for square\n" +
                   "Enter 3 for rectangle");
Scanner scanner = new Scanner(System.in);
int choice = Integer.parseInt(scanner.nextLine());
if (choice == 1) {
    System.out.println("Enter the radius of the circle");
    float radius = Float.parseFloat(scanner.nextLine());
    System.out.println("The area of circle of radius "+ radius + "is " + circle(radius));
} else if (choice == 2) {
    System.out.println("Enter the length of the square");
    float length = Float.parseFloat(scanner.nextLine());
    System.out.println("The area of square of side length "+ length + " is " + square(length));
} else if (choice == 3) {
    System.out.println("Enter the length of the rectangle");
    float length = Float.parseFloat(scanner.nextLine());
    System.out.println("Enter the breadth of the rectangle");
    float breadth = Float.parseFloat(scanner.nextLine());
    System.out.println("The area of rectangle of length "+ length +
                       "and breadth "+breadth+ " is " + rectangle(length,breadth));
} else {
    System.out.println("Invalid choice");
    break;
}
```

A Scanner object is used to read user input from the console. The user's input is converted into an integer using Integer.parseInt().

If the user enters **1** for circle, the user is asked to input the circle's radius. The radius that is input as string is converted into a float using Float.parseFloat(). The circle method is called, and its result is displayed.

If the user enters **2** for square, the user is asked to input the square's side length. The length that is input as string is converted into a float using Float.parseFloat(). The square method is called, and its result is displayed.

If the user enters **3** for rectangle, the user is asked to input the rectangle's length and breadth. The rectangle method is called, and its result is displayed.

7. After you complete all the code, you will see the following program.

```
import java.util.Scanner;
public class AreaCalculator {
    private static float pi = 3.142f;
    private static float circle(float radius) {
        return (pi * radius * radius);
    }
    private static float square(float length) {
        return length * length;
    }
    private static float rectangle(float length, float breadth) {
        return length * breadth;
```

```
    }
    public static void main(String s[]) {
        System.out.println("Welcome to the area calculator!");
        while(true) {
            System.out.println("\nEnter 1 for circle\n" +
                               "Enter 2 for square\n" +
                               "Enter 3 for rectangle");
            Scanner scanner = new Scanner(System.in);
            int choice = Integer.parseInt(scanner.nextLine());
            if (choice == 1) {
                System.out.println("Enter the radius of the circle");
                float radius = Float.parseFloat(scanner.nextLine());
                System.out.println("The area of circle of radius "+ radius + "is " + circle(radius));
            } else if (choice == 2) {
                System.out.println("Enter the length of the square");
                float length = Float.parseFloat(scanner.nextLine());
                System.out.println("The area of square of side length "+ length + " is " + square(length));
            } else if (choice == 3) {
                System.out.println("Enter the length of the rectangle");
                float length = Float.parseFloat(scanner.nextLine());
                System.out.println("Enter the breadth of the rectangle");
                float breadth = Float.parseFloat(scanner.nextLine());
                System.out.println("The area of rectangle of length "+ length +
                                   "and breadth "+breadth+ " is " + rectangle(length,breadth));
            } else {
                System.out.println("Invalid choice");
                break;
            }
        }
    }
}
```

8. Compile the Java program, specifying the destination directory as the `classes` directory that you created.

```
javac -d classes src/AreaCalculator.java
```

9. Set the `CLASSPATH` variable.

```
export CLASSPATH=$CLASSPATH:/home/project/my_custom_method_proj/classes
```

10. Run the program and test with variable combinations.

```
java AreaCalculator
```

You will see the following output:

```
Welcome to the area calculator!
Enter 1 for circle
Enter 2 for square
Enter 3 for rectangle
1
Enter the radius of the circle
8
The area of circle of radius 8.0 is 201.088
Enter 1 for circle
Enter 2 for square
Enter 3 for rectangle
```

Practice Exercise

1. Add methods to calculate volume of sphere, cube and cuboid.

▶ Click here for sample code

Conclusion

In this lab, you learned how to add methods to a class which accepts parameters and returns values.

Author(s)

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