

Lab: Polymorphism and Abstraction

This document defines the exercises for the ["Python OOP" course at @Software University](#).

Please, submit your source code solutions for the described problems to the [Judge System](#).

1. Robots

Refactor the [provided code](#), so we do not need to do any type-checking. The **classes** should implement the method to return the number of sensors for **each type** of robot.

*This task is **not included** in the Judge System. You are not supposed to submit a solution for it.

2. ImageArea

Create a class called **ImageArea** which will store the **width** and the **height** of an image. Create a **method** called **get_area()** which will return the **area** of the image. We have also to implement all the magic methods for the **comparison** of two image areas (>, >=, <, <=, ==, !=), which will compare their areas.

Examples

Test Code	Output
<pre>a1 = ImageArea(7, 10) a2 = ImageArea(35, 2) a3 = ImageArea(8, 9) print(a1 == a2) print(a1 != a3)</pre>	True True
<pre>a1 = ImageArea(7, 10) a2 = ImageArea(35, 2) a3 = ImageArea(8, 9) print(a1 != a2) print(a1 >= a3)</pre>	False False
<pre>a1 = ImageArea(7, 10) a2 = ImageArea(35, 2) a3 = ImageArea(8, 9) print(a1 <= a2) print(a1 < a3)</pre>	True True

3. Playing

Create a function called **start_playing** which will receive an instance and will return its **play()** method.

Submit only the start_playing function in the judge system

Examples

Test Code	Output
<pre>class Guitar:</pre>	Playing the guitar

<pre>def play(self): return "Playing the guitar" guitar = Guitar() print(start_playing(guitar))</pre>	
<pre>class Children: def play(self): return "Children are playing" children = Children() print(start_playing(children))</pre>	Children are playing

4. Shapes

Create an abstract class **Shape** with abstract methods **calculate_area** and **calculate_perimeter**. Create classes **Circle** (receives radius upon initialization) and **Rectangle** (receives height and width upon initialization) that implement those methods (returning the result). The fields of **Circle** and **Rectangle** should be **private**.

Submit all the classes and your imports in the judge system

Examples

Test Code	Output
<pre>circle = Circle(5) print(circle.calculate_area()) print(circle.calculate_perimeter())</pre>	<pre>78.53981633974483 31.41592653589793</pre>
<pre>rectangle = Rectangle(10, 20) print(rectangle.calculate_area()) print(rectangle.calculate_perimeter())</pre>	<pre>200 60</pre>