QAP 3 – Screening Questions, Explanations and Output Screenshot

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Date of Submission: 16/03/2025

Project: QAP3

Answer the feedback questions

1/ I did this project around 10-11 hours

2/ I have used your lecture, O’Reilly, and Youtube

3/ No, I didn’t

4/ No, I didn’t

5/ Around 7/10

Problem 1: High School Application

Objective

This problem focuses on class inheritance by extending a Person superclass to create Student, Teacher, and CollegeStudent subclasses.

Implementation Details

1/ Person class:

- Attributes: name, age, gender.
- Methods: Getters, setters, and toString().

2/ Student class (inherits Person)

- Adds attributes: studentId, GPA.
- Implements getIdNum(), getGPA(), setIdNum(), setGPA().

3/ Teacher class (inherits Person)

- Adds attributes: subject, salary.
- Implements getSubject(), getSalary(), setSubject(), setSalary().

4/ CollegeStudent class (inherits Student)

- Adds attributes: major, year.
- Implements getMajor(), getYear(), setMajor(), setYear().

Testing (Demo.java)

- Objects of Person, Student, Teacher, and CollegeStudent are created and printed.

- Demonstrates object instantiation, method calls, and inheritance.

Problem 2: Point and MovablePoint

Objective

This problem introduces encapsulation, getters, setters, and inheritance. A Point class represents a coordinate (x, y), while MovablePoint extends it by adding motion (xSpeed, ySpeed).

Implementation Details

1/ Point class

- Attributes: x, y (private).
- Methods: Getters and setters for x, y, setXY(), getXY(), and toString().

2/ MovablePoint class (inherits Point)

- Adds attributes: xSpeed, ySpeed.
- Implements move(), which updates x and y using speed.

- Implements getSpeed(), setSpeed(), and toString().

Testing (Demo2.java)

- A Point object and MovablePoint object are created.
- A Point object and MovablePoint object are created.

Problem 3: Abstract Shape Classes

Objective

This problem demonstrates abstraction by defining a Shape superclass that cannot be instantiated but provides common functionality for Circle, Ellipse, Triangle, and EquilateralTriangle.

Implementation Details

1/ Shape class

- Attribute: name.
- Abstract methods: getArea(), getPerimeter().

- Implements toString() to display shape details.

2/ Subclasses (Circle, Ellipse, Triangle, EquilateralTriangle)

- Implement getArea() and getPerimeter() with specific formulas.
- EquilateralTriangle extends Triangle, ensuring all sides are equal.

Testing (Demo3.java)

- An array of Shape objects stores different shapes.
- An array of Shape objects stores different shapes.

Problem 4: Interfaces & Scaling Shapes

Objective

This problem extends Problem 3 by introducing an interface (Scalable), which allows shapes to be resized dynamically.

Implementation Details

1/ Scalable interface

- Defines scale(double factor), must be implemented by shapes.

2/ Modifications to Shape and Subclasses

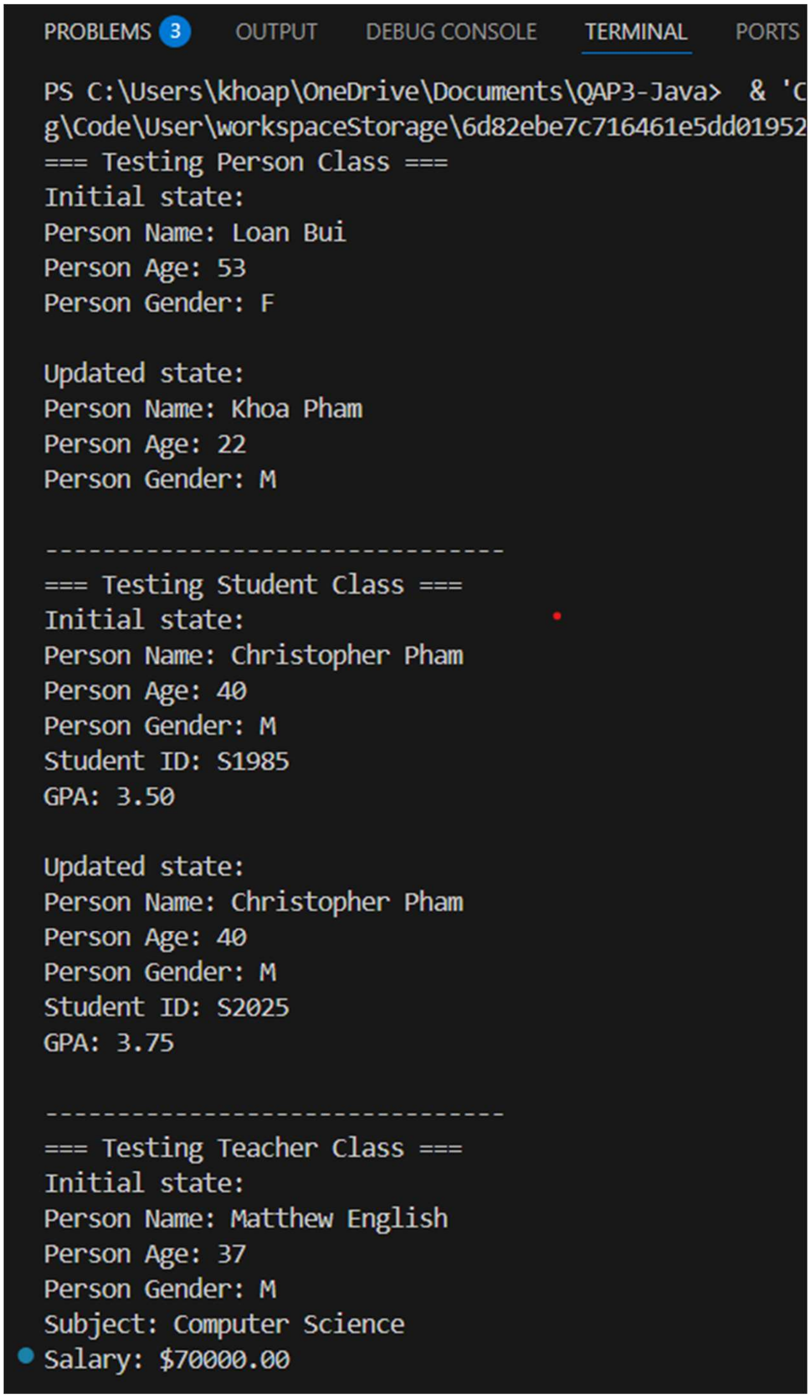
- Shape now implements Scalable but does not override scale().
- Each subclass (Circle, Ellipse, Triangle, EquilateralTriangle) implements scale(), modifying its attributes.

Testing (Demo4.java)

- Prints all shapes before and after scaling to verify correctness.

Screenshot of the output

Problem 1



```
PS C:\Users\khoap\OneDrive\Documents\QAP3-Java>  & 'C
g\Code\User\workspaceStorage\6d82ebe7c716461e5dd01952
=== Testing Person Class ===
Initial state:
Person Name: Loan Bui
Person Age: 53
Person Gender: F

Updated state:
Person Name: Khoa Pham
Person Age: 22
Person Gender: M

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=== Testing Student Class ===
Initial state:
Person Name: Christopher Pham
Person Age: 40
Person Gender: M
Student ID: S1985
GPA: 3.50

Updated state:
Person Name: Christopher Pham
Person Age: 40
Person Gender: M
Student ID: S2025
GPA: 3.75

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=== Testing Teacher Class ===
Initial state:
Person Name: Matthew English
Person Age: 37
Person Gender: M
Subject: Computer Science
Salary: $70000.00
```

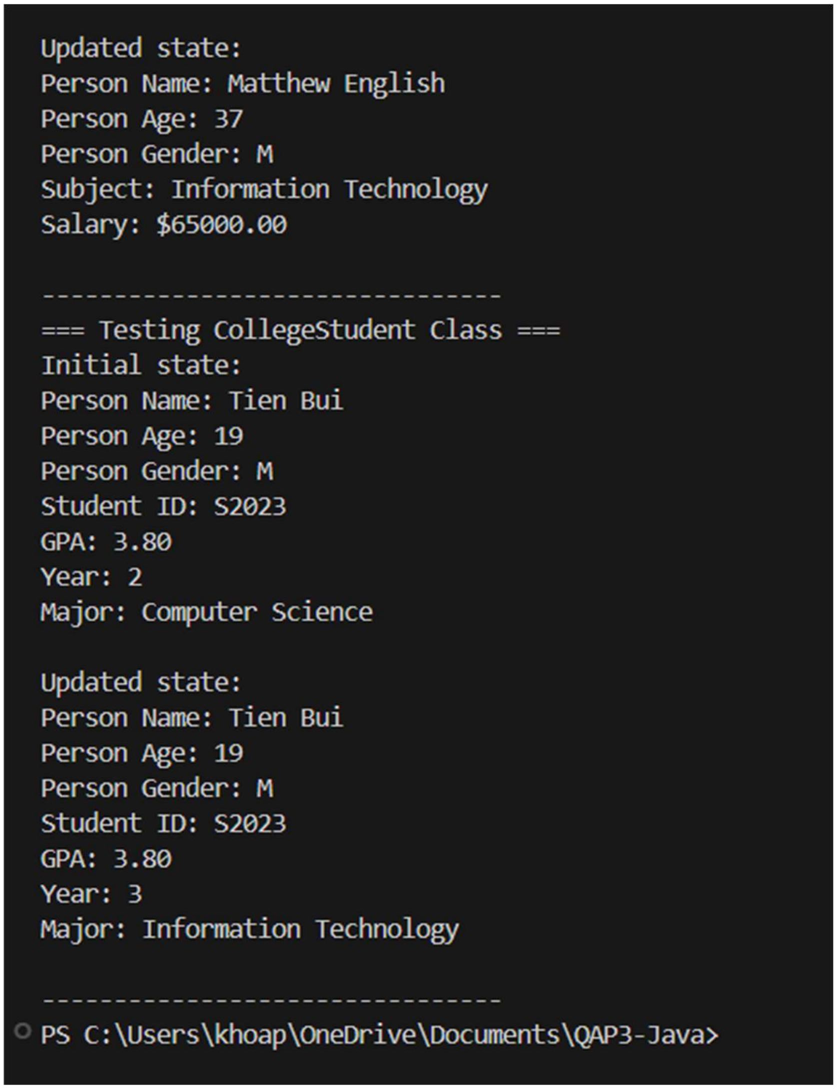

```
Updated state:
Person Name: Matthew English
Person Age: 37
Person Gender: M
Subject: Information Technology
Salary: $65000.00

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=== Testing CollegeStudent Class ===
Initial state:
Person Name: Tien Bui
Person Age: 19
Person Gender: M
Student ID: S2023
GPA: 3.80
Year: 2
Major: Computer Science

Updated state:
Person Name: Tien Bui
Person Age: 19
Person Gender: M
Student ID: S2023
GPA: 3.80
Year: 3
Major: Information Technology

--------------------------------
PS C:\Users\khoap\OneDrive\Documents\QAP3-Java>
```
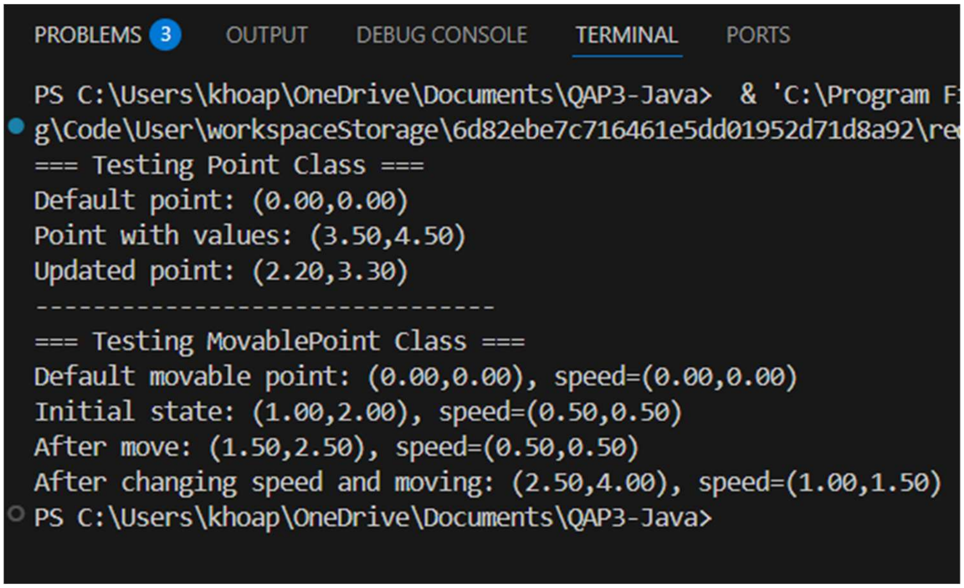

Problem 2



```
PS C:\Users\khoap\OneDrive\Documents\QAP3-Java>  & 'C:\Program F
g\Code\User\workspaceStorage\6d82ebe7c716461e5dd01952d71d8a92\re
=== Testing Point Class ===
Default point: (0.00,0.00)
Point with values: (3.50,4.50)
Updated point: (2.20,3.30)
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=== Testing MovablePoint Class ===
Default movable point: (0.00,0.00), speed=(0.00,0.00)
Initial state: (1.00,2.00), speed=(0.50,0.50)
After move: (1.50,2.50), speed=(0.50,0.50)
After changing speed and moving: (2.50,4.00), speed=(1.00,1.50)
PS C:\Users\khoap\OneDrive\Documents\QAP3-Java>
```
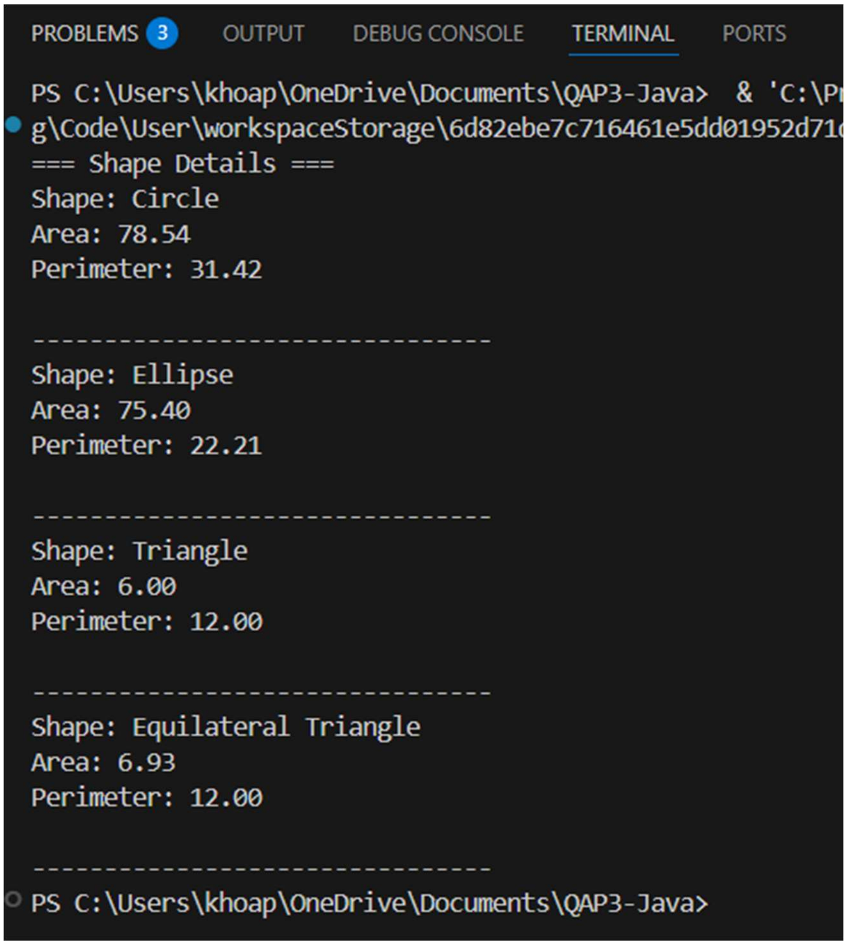

Problem 3



```
PS C:\Users\khoap\OneDrive\Documents\QAP3-Java>  & 'C:\P
g\Code\User\workspaceStorage\6d82ebe7c716461e5dd01952d71
=== Shape Details ===
Shape: Circle
Area: 78.54
Perimeter: 31.42

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Shape: Ellipse
Area: 75.40
Perimeter: 22.21

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Shape: Triangle
Area: 6.00
Perimeter: 12.00

--------------------------------
Shape: Equilateral Triangle
Area: 6.93
Perimeter: 12.00

--------------------------------
PS C:\Users\khoap\OneDrive\Documents\QAP3-Java>
```
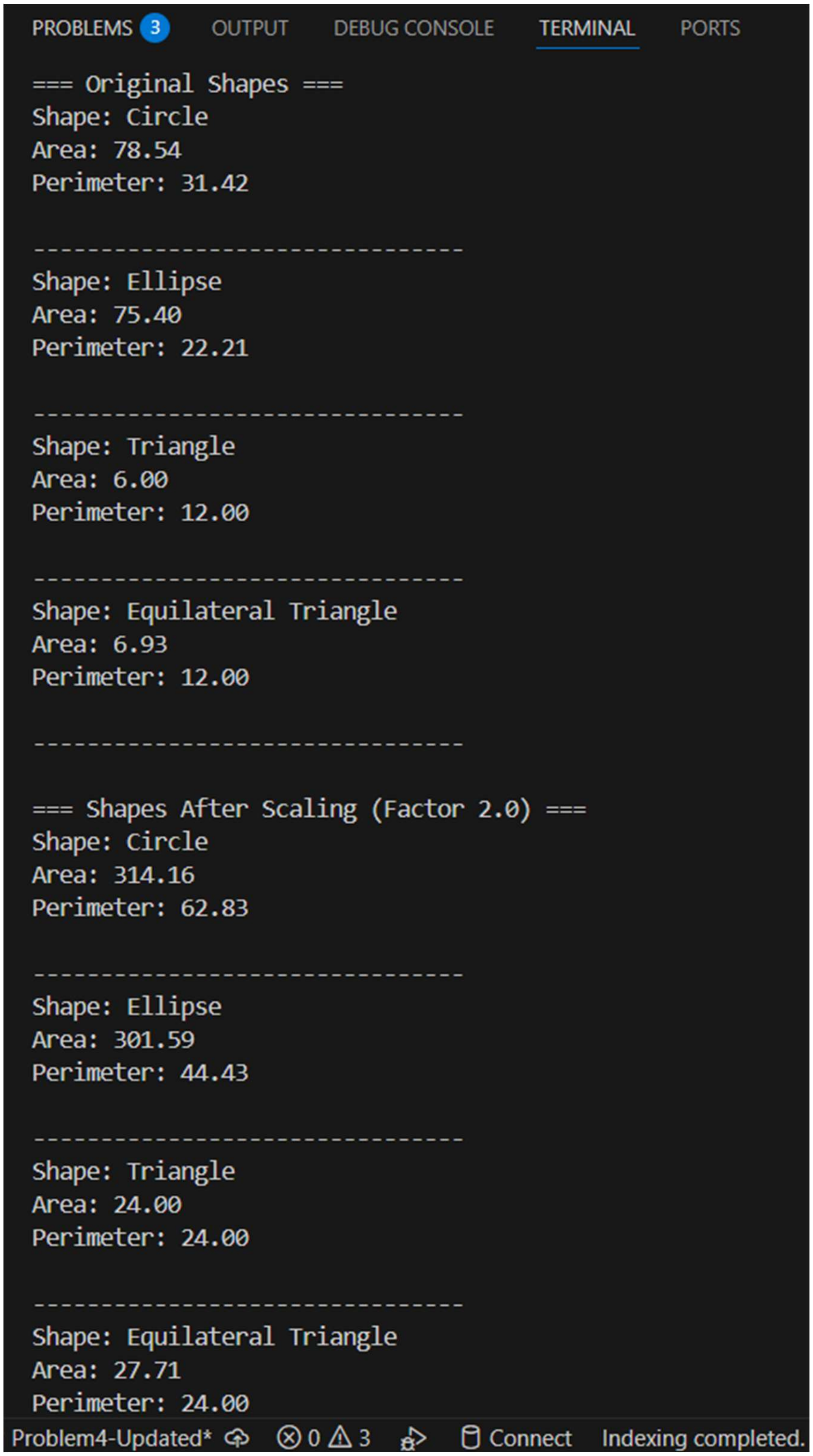

Problem 4



```
=== Original Shapes ===
Shape: Circle
Area: 78.54
Perimeter: 31.42

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Shape: Ellipse
Area: 75.40
Perimeter: 22.21

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Shape: Triangle
Area: 6.00
Perimeter: 12.00

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Shape: Equilateral Triangle
Area: 6.93
Perimeter: 12.00

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=== Shapes After Scaling (Factor 2.0) ===
Shape: Circle
Area: 314.16
Perimeter: 62.83

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Shape: Ellipse
Area: 301.59
Perimeter: 44.43

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Shape: Triangle
Area: 24.00
Perimeter: 24.00

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Shape: Equilateral Triangle
Area: 27.71
Perimeter: 24.00
```