

ASSIGNMENT/ASSESSMENT ITEM COVER SHEET

Student Name:

FIRST NAME

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Student Number:

Email:

Course Code

Course Title

(Example)

SENG2200 PROGRAMMING LANGUAGES & PARADIGMS

(Example)

Intro to University

Campus of Study: (eg Callaghan, Ourimbah, Port Macquarie)

Assessment Item Title: Due Date/Time:

Tutorial Group (If applicable): Word Count (If applicable):

Lecturer/Tutor Name:

Extension Granted: ☐ Yes ☐ No Granted Until:

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Jenny Zeng

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04/05/2021

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SENG2200 Programming Languages & Paradigms Assignment 2 Report

The SENG2200 Programming Languages & Paradigms Assignment 2 was first written on 15/04/2021 and finished on 04/05/2021.

Abstract

This assignment 2 aims to build the understanding of Java programming in topics of interface, polymorphism, generics, and iterator and furthermore extend on previous assignment 1.

Member Data Fields

Node.java private Polygon data; private Node next; private Node prev;	Point.java private double x; private double y;
PlanarShape.java abstract String toString(); abstract double area(int n); abstract double originDistance(); public int compareTo(PlanarShape obj);	Polygon.java private double area; private Point[] points; private int i = 0;
Circle.java private double area; private Point[] centerpoint; private int r = 0;	SemiCircle.java private double area; private Point[] SemiCirclepoint;
LinkedList.java private int modCount; private Node<T> sentinel; private int size;	FactoryInterface.java static PlanarShape make(String ShapeType) throws Exception{};
FactoryImplementation.java PlanarShape make(String ShapeType) throws Exception;	PA2.java static void main(String[] args) throws IOException

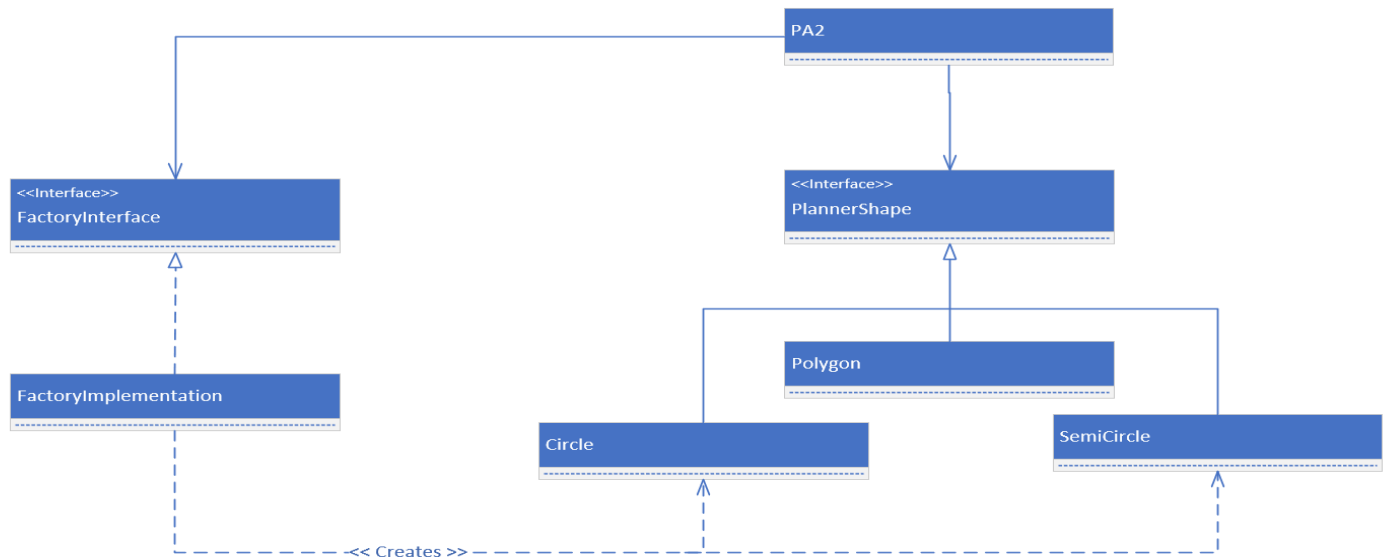
Coding Details

On the 15/04/2021 22:00-1:30, the first thing and the most important thing I would do when starting an new assignment is to read though all the specification that has been provided by the course and draw down a brief concept of how many java classes that I might need to implement, according to the assignment 2, that it has to specifically included Triangle and Square figures and we do required to **draw the UML class diagram** for this new program.

UML class diagram

SENG2200 Programming Languages & Paradigms
Assignment 2

Student number : c3238805
Student name: NI ZENG
date: 04/05/2021



Assignment 2 java class that need to be implement which are: **Point.java, PlanarShape.java, Polygon.java, Circle.java, SemiCircle.java, Node.java, LinkedList.java, FactoryImplementation.java, FactoryInterface.java and PA2.java**

15/04 note

implemented: Node.java, Point.java, PlanarShape.java, Polygon.java, Circle.java, SemiCircle.java.

Error Found & corrected: on the 15/04/2021 & solutions: having trouble understand and implement the standard Comparable<T> interface.

19/04note

On the 19/04 16:00-18:00, I have done some research Online and manage to implement a Comparable<T> interface which will implemented by the planner Shape class. The method that I added on is: public int compareTo(PlanarShape obj).

On the 19/04 20:00 - 24:00, I have then focus LinkedList and P2 without implement the iterator to test how the abstract class and subclasses works but the output data was not what I expected.
first time Unsorted list print which contained wrong output from a.txt:

Unsorted list

```
POLY=[(0.00,0.00)(0.00,2.00)(2.00,2.00)(2.00,0.00)]: 4.00
POLY=[(1.00,1.00)(1.00,3.00)(3.00,3.00)(3.00,1.00)]: 4.00
POLY=[(4.00,0.00)(4.00,8.00)(7.00,8.00)(7.00,3.00)(9.00,0.00)(7.00,1.00)]: 24.50
POLY=[(-3.00,0.00)(2.00,4.00)(3.00,1.00)(-4.00,-3.00)]: 18.00
POLY=[(2.00,4.00)(5.00,3.00)(3.00,2.00)(4.00,1.00)(2.00,1.00)]: 5.00
POLY=[(5.00,11.00)(12.00,8.00)(9.00,5.00)(5.00,6.00)(3.00,4.00)]: 30.00
POLY=[(4.00,0.00)(4.00,8.00)(7.00,8.00)]: 12.00
```

```

SEMI=[(2.00,2.00)(2.00,2.00)]: 0.00
POLY=[(1.00,3.00)(4.00,2.00)]: 0.00
SEMI=[(4.00,3.00)(4.00,3.00)]: 0.00
SEMI=[(6.00,4.00)(6.00,4.00)]: 0.00
CIRC=[(4.00,2.00)]: 0.00
CIRC=[(1.00,5.00)]: 0.00
POLY=[(2.00,3.00)(5.00,2.00)(3.00,1.00)]: 2.50
SEMI=[(2.00,4.00)(2.00,4.00)]: 0.00
SEMI=[(-4.00,3.00)(-4.00,3.00)]: 0.00
CIRC=[(3.00,5.00)]: 0.00

```

Error Found & corrected: in the SemiCircle class addPoint(double x,doubly y) method, i need to add on another parameter to indicate which SemiCirclepoint[pointNo] i want to add in to the arry, since the Semi Circle only need two points import, i change the method to :addPoint(int pointNo,double x,doubly y) and it does correct the output.

20/04note

20/04 Unsorted list

Unsorted list

```

POLY=[(0.00,0.00)(0.00,2.00)(2.00,2.00)(2.00,0.00)]: 4.00
POLY=[(1.00,1.00)(1.00,3.00)(3.00,3.00)(3.00,1.00)]: 4.00
POLY=[(4.00,0.00)(4.00,8.00)(7.00,8.00)(7.00,3.00)(9.00,0.00)(7.00,1.00)]: 24.50
POLY=[(-3.00,0.90)(2.23,4.80)(3.00,1.00)(-4.20,-3.90)]: 25.78
POLY=[(2.00,4.00)(5.00,3.00)(3.00,2.00)(4.00,1.00)(2.00,1.00)]: 5.00
POLY=[(5.00,11.00)(12.00,8.00)(9.00,5.00)(5.00,6.00)(3.00,4.00)]: 30.00
POLY=[(4.00,0.00)(4.00,8.00)(7.00,8.00)]: 12.00
SEMI=[(2.00,1.00)(2.75,2.25)]: 3.34
POLY=[(1.00,3.00)(4.00,2.00)]: 0.00
SEMI=[(4.50,2.00)(4.00,4.20)]: 8.00
SEMI=[(6.00,3.00)(6.00,4.00)]: 1.57
CIRC=[(3.00,4.00) 2.00]: 12.57
CIRC=[(2.00,1.00) 5.00]: 78.54
POLY=[(2.00,3.00)(5.00,2.00)(3.00,1.00)]: 2.50
SEMI=[(2.00,3.00)(2.00,4.00)]: 1.57
SEMI=[(-4.00,2.00)(-4.00,3.00)]: 1.57
CIRC=[(4.00,3.50) 5.00]: 78.54

```

Error Found & corrected: the area() method both in Circle and SemiCircle class were : Double area = Math.PI * (r * r); return area; which should be : area = Math.PI * (r * r); return area; cause the private double area; was already been declare inside the class. After I fixed that, the area of all the PlannarShape class now can be correctly print out.

03/05 note

On the 03/05 12:00-18:00, since all the data can be printed out correctly without using the iterator interface, I continually to implement the following class : LinkedList.java which will implements Iterable<T>, and add the T generator for the Node class. As well as adding a modeCount as variable in LinkedList, expectedModCount variable in private class thisiterator which will implements the Iterator<T>. inside the private thisiterator constructor, I set the expectedModCount = modCount to monitor all the action within the LinedList. After all the implement done for LinkedList, I then use Iterator<PlannarShape> l1= list1.iterator() to test the list result.

Error Found & corrected: The result was printed repeatedly, the unsorted List is being print multiple time until the program cashed. I then notice that it could be an issues while I was linking the sentinel node to itself when the LinkedList constructor created, in order to fix that problem, in the linkedList constructor, there is just

```
sentinel = new Node<T>(); size=0; modCount = 0;
```

After I edited the code, The unsorted List is been print correctly with the use of iterator().

04/05 note

On the 04/05 13:00-16:00, I have mainly focus on dealing with the sorted list. I went back to the linkedList.java and createa and method inserInorder(T data). But when I tried to test the list2 output result, the result was not what I was expected.

```
Sorted list
CIRC=[(4.00,3.50) 5.00]: 78.54
CIRC=[(2.00,1.00) 5.00]: 78.54
POLY=[(5.00,11.00)(12.00,8.00)(9.00,5.00)(5.00,6.00)(3.00,4.00)]: 30.00
POLY=[(-3.00,0.90)(2.23,4.80)(3.00,1.00)(-4.20,-3.90)]: 25.78
POLY=[(4.00,0.00)(4.00,8.00)(7.00,8.00)(7.00,3.00)(9.00,0.00)(7.00,1.00)]: 24.50
POLY=[(2.00,4.00)(5.00,3.00)(3.00,2.00)(4.00,1.00)(2.00,1.00)]: 5.00
CIRC=[(3.00,4.00) 2.00]: 12.57
POLY=[(4.00,0.00)(4.00,8.00)(7.00,8.00)]: 12.00
POLY=[(1.00,1.00)(1.00,3.00)(3.00,3.00)(3.00,1.00)]: 4.00
SEMI=[(4.50,2.00)(4.00,4.20)]: 8.00
POLY=[(0.00,0.00)(0.00,2.00)(2.00,2.00)(2.00,0.00)]: 4.00
SEMI=[(2.00,1.00)(2.75,2.25)]: 3.34
SEMI=[(6.00,3.00)(6.00,4.00)]: 1.57
PS D:\2021S1\SENG2200\A2> █
```

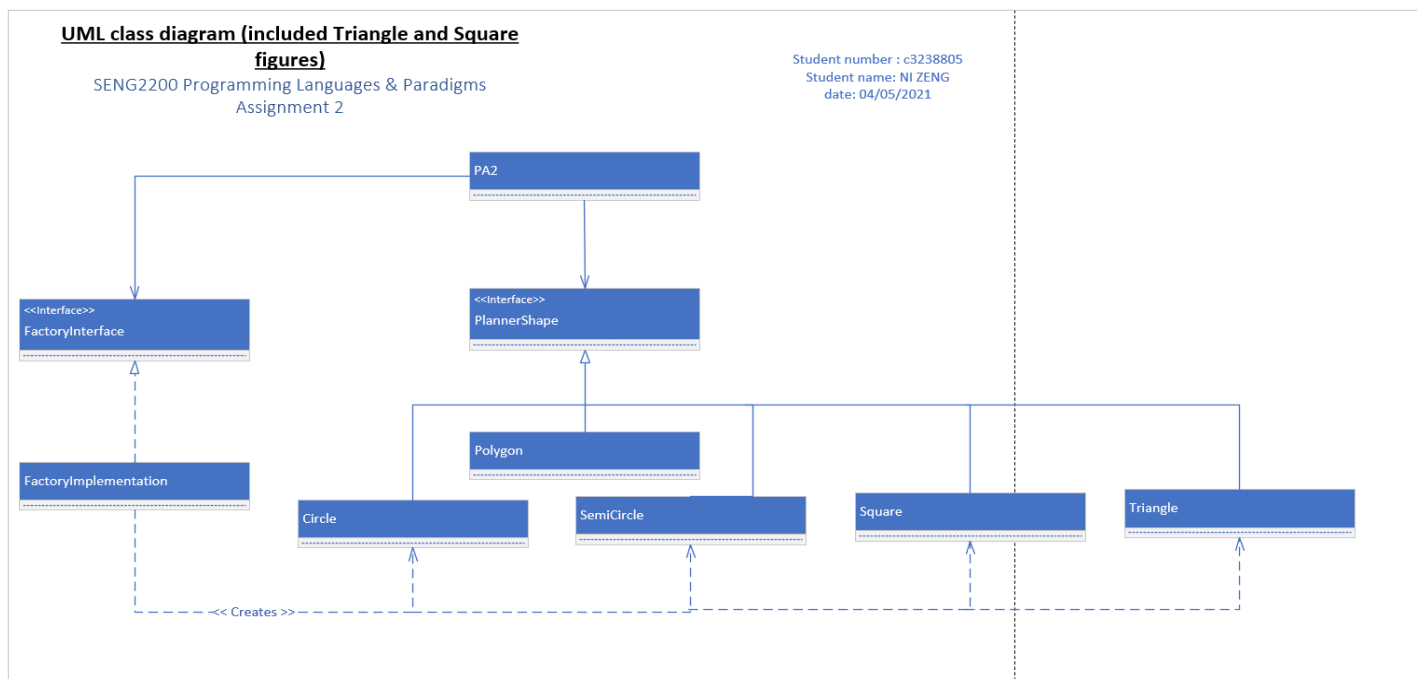
Error Found & corrected: I recheck the result and use the debug tried to find out where was wrong, it turns out the Comparable<T> interface that I implement earlier was having some logic problem, I fix the logic issues with the compareTo(PlannarShape) by using integer 1 indicate true, -1 indicate false. And as well as simplified the method insertInOrder(T new_data) as well as inserBefore(T before,T obj). and went back to test the list2 result. And it did fix the error.

```
Sorted list
CIRC=[(4.00,3.00) 5.00]: 78.54
CIRC=[(2.00,1.00) 5.00]: 78.54
POLY=[(5.00,11.00)(12.00,8.00)(9.00,5.00)(5.00,6.00)(3.00,4.00)]: 30.00
POLY=[(4.00,0.00)(4.00,8.00)(7.00,8.00)(7.00,3.00)(9.00,0.00)(7.00,1.00)]: 24.50
POLY=[(-3.00,0.00)(2.00,4.00)(3.00,1.00)(-4.00,-3.00)]: 18.00
CIRC=[(3.00,4.00) 2.00]: 12.57
POLY=[(4.00,0.00)(4.00,8.00)(7.00,8.00)]: 12.00
POLY=[(2.00,4.00)(5.00,3.00)(3.00,2.00)(4.00,1.00)(2.00,1.00)]: 5.00
POLY=[(1.00,1.00)(1.00,3.00)(3.00,3.00)(3.00,1.00)]: 4.00
POLY=[(0.00,0.00)(0.00,2.00)(2.00,2.00)(2.00,0.00)]: 4.00
POLY=[(2.00,3.00)(5.00,2.00)(3.00,1.00)]: 2.50
SEMI=[(6.00,3.00)(6.00,4.00)]: 1.57
SEMI=[(-4.00,2.00)(-4.00,3.00)]: 1.57
SEMI=[(4.00,2.00)(4.00,3.00)]: 1.57
SEMI=[(2.00,3.00)(2.00,4.00)]: 1.57
SEMI=[(2.00,1.00)(2.00,2.00)]: 1.57
POLY=[(1.00,3.00)(4.00,2.00)]: 0.00
PS D:\2021S1\SENG2200\A2> █
```

On the 04/05 18:00-20:00, I then created the last two java class: FatoryInterface.java and FactoryImplementation.java to warp the PlannarShape. Then use it in PA2.java. After every done, I went back double checked all the result and java file to make sure the java code formed nicely and added in my name and assignment heading for all the java files.

Total error found: 5 during the implementation of assignment 2.

Question 3. Provide a (brief) design of how you would further extend your PA2 so that it specifically included Triangle and Square figures. Draw the UML class diagram for this new program (intricate detail not required). What attribute data do you need in each case?



For The Square.java, the attribute would be private double area; private Point[] Square.
For the Trangle.java the attribute would be private double area; private Point[] Trangle.

Question 4. Investigate the mathematical structure of an Ellipse on the Cartesian plane. How would you model the Ellipse? How would you then calculate its area and originDistance()? How would this be incorporated into your program? Draw another UML class diagram to show this.

Formular : Area of an ellipse = $\pi r_1 r_2$, In order to calculate the ellipse area, 4 points input will be need.

The area() in Ellipse would be:

```

public double area() {
    area = 0;
    double r1 = Math.sqrt((ellipsePoint [1].getX() - ellipsePoint [0].getX())*(ellipsePoint [1].getX() - ellipsePoint [0].getX()) +
        (ellipsePoint [1].getY() - ellipsePoint [0].getY())*(ellipsePoint [1].getY() - ellipsePoint [0].getY()));
    double r2 = Math.sqrt((ellipsePoint [2].getX() - ellipsePoint [3].getX())*(ellipsePoint [2].getX() - ellipsePoint [3].getX()) +
        (ellipsePoint [2].getY() - ellipsePoint [3].getY())*(ellipsePoint [2].getY() - SemiCirclepoint[3].getY()));
    ellipsePoint

    area = Math.PI * (r1 * r2) ;
    return area;
}
  
```

```
}
```

The originDistance () in Ellipse would be:

```
public double originDistance() {
```

```
    double min = ellipsePoint [0].distanceCalculate(ellipsePoint [0].getX(), ellipsePoint [0].getY());
```

```
    for (int c = 0; c < ellipsePoint.length; c++) {
```

```
        double d1 = ellipsePoint [c].distanceCalculate(ellipsePoint [c].getX(), ellipsePoint [c].getY());
```

```
        if (min > d1) {
```

```
            min = d1;
```

```
        } else if (min == d1) {
```

```
            min = ellipsePoint [0].distanceCalculate(ellipsePoint [0].getX(), ellipsePoint [0].getY());
```

```
        }
```

```
    }
```

```
    return min;
```

```
}
```

**UML class diagram (included Triangle and Square
and Ellipse figures)**

SENG2200 Programming Languages & Paradigms
Assignment 2

Student number : c3238805
Student name: NI ZENG
date: 04/05/2021

