

Week 5- Assignment (3 marks)

Note: Try to make the best use of appropriate C++ features.

Objective: This assignment aims to deepen your understanding of advanced C++ class features, including **constructors**, **assignment** operators, **move semantics**, **friend functions**, and **class aggregation**. You will implement two related classes—Circle and Point—to explore their interactions and gain hands-on experience with core object-oriented programming principles in C++.

Description:

- In this assignment, you will implement two C++ classes, Circle and Point, based on the provided UML diagram. And use **the given main function** to produce the output shown below.
- The Point class represents a point in 2D space using x and y coordinates.
- The Circle class models a circle defined by a Point object as its center and a double representing its radius.
- The friend function operator<< in the Point class should print the point's details. If
 the Point object has been moved and is empty, it should output *null* instead of
 dereferencing an invalid pointer.



```
Circle
- center: Point
- radius: double
+ Circle(x:double=0, y:double=0, radius:double=0):
+ setCenter(x:double, y:double): void
+ setCenter(newCenter: const Point&): void
+ setRadius(newRadius: double): void
+ getCenter(): Point
+ getRadius(): double
+ <<friend>> operator<<(out:ostream&, c1:const Circle&): ostream&
                                  Point
- x: shared ptr<double>
- y: shared ptr<double>
+ Point(x: double=0, y:double=0):
+ Point(other: const Point&):
+ Point(other: Point&&):
+ operator=(other: const Point&): Point&
+ operator=(other: Point&&): Point&
+ setX(x: double): void
+ setY(y: double): void
+ getX(): double
+ getY(): double
+ <<friend>> operator<<(out:ostream&, p1:const Point&): ostream&
```

Input:

Please use the provided *run_wa5.cpp* to test your implementation.

Don't modify the **main** function in the cpp.

Output: (should be like the below)



```
______
Output 1:
p1 Point(1, 1)
p2 Point(2, 2)
p1 Point(1, 1)
p2 Point(3, 3)
_____
Output 2:
p2 Point(null,null)
p3 Point(3, 3)
p1 Point(null,null)
p3 Point(1, 1)
Output 3:
p3 Point(1, 1)
c1 Circle(center: Point(10, 10), radius: 0)
c1 Circle(center: Point(10, 10), radius: 0)
c2 Circle(center: Point(20, 20), radius: 0)
______
Output 4:
c2 Circle(center: Point(20, 20), radius: 0)
c3 Circle(center: Point(30, 30), radius: 0)
c2 Circle(center: Point(null, null), radius: 0)
c3 Circle(center: Point(20, 20), radius: 0)
_____
```

Submit:

1, all C++ source code:

Organizing the source code into separate files is not mandatory.

You can consolidate all code into a single cpp file.

- 2, WA5.txt: a txt file contains all the source code.
- 3, output.jpg (or png, bmp): a screenshot of the output by your program

Please refer to the submission page for the Marking Rubric.