

<b>Munkhtenger Munkh-Aldar</b> WSR292 WSR292@inf.elte.hu	<b>1. assignment/6th. Task</b>	<b>11 October 2022</b>
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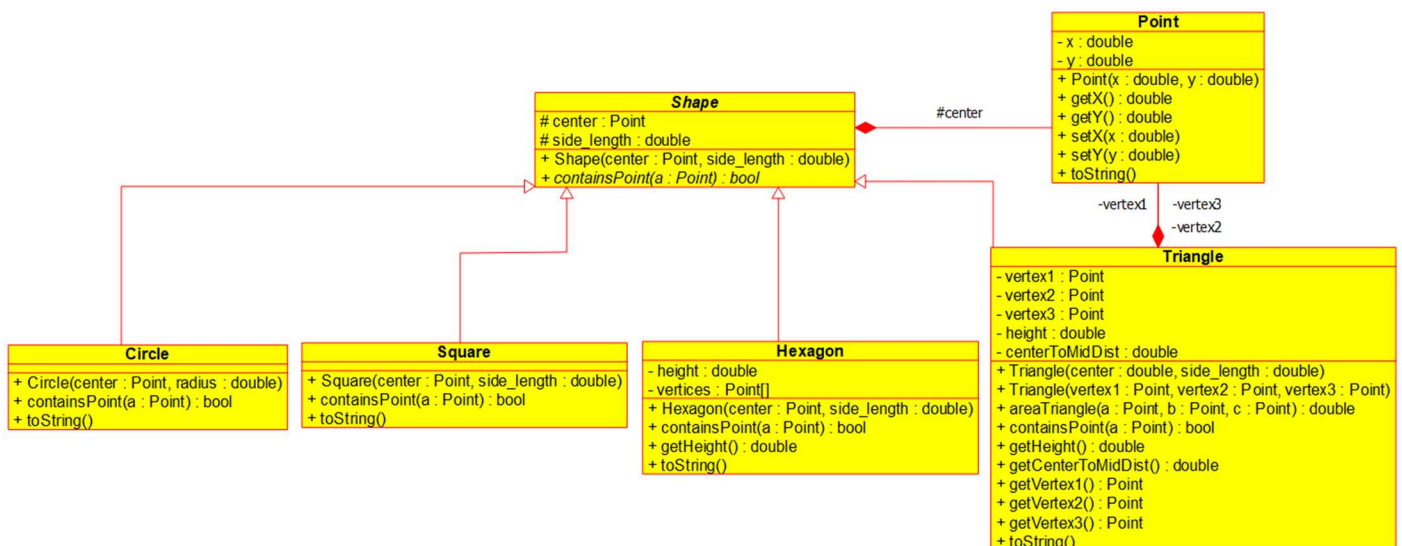
## Task

Choose a point on the plane and fill a collection with several regular shapes (circle, regular triangle, square, regular hexagon). How many shapes contain the given point?

Each shape can be represented by its center and side length (or radius), if we assume that one side of the polygons are parallel with x axis, and its nodes lies on or above this side. Load and create the shapes from a text file. The first line of the file contains the number of the shapes, and each following line contain a shape. The first character will identify the type of the shape, which is followed by the center coordinate and the side length or radius. Manage the shapes uniformly, so derive them from the same super class.

## UML Class Diagram

This diagram was made with Umbrello.



## Description of each method

### Point Class

Constructor: Constructs point with given x and y coordinates.

toString(): Converts point coordinates into string form.

### Shape Class

Constructor: Constructs shape with a center point and side length.

containsPoint(Point a): Check if a given point is contained in the shape.

### Circle Class

Constructor: Constructs a circle with a center point and radius.

containsPoint(Point a): Check if a given point is contained in the circle.

toString(): Converts circle details coordinates into string form.

### Circle Class

Constructor: Constructs a square with a center point and side length.

containsPoint(Point a): Check if a given point is contained in the square.

toString(): Converts square details coordinates into string form.

### Triangle Class

Constructor1: Constructs a triangle with a center point and side length. Sets the 3 vertices by finding the height of the triangle as well as apothem.

Constructor2 : Second constructor for Triangle. It gets 3 vertices and forms a triangle.

AreaTriangle(Point a,b,c): A method for calculating the area of a triangle by giving three vertices.

containsPoint(Point a): Check if a given point is contained in the triangle.

toString(): Converts triangle details coordinates into string form.

### Hexagon class

Constructor: Constructs a hexagon with a center point and side length. Sets the 6 vertices by finding the height of the hexagon.

containsPoint(Point a): Check if a given point is contained in the hexagon.

toString(): Converts hexagon details coordinates into string form.

### DataHandling class

read(file): Reads from the file and fills the array with shapes.

# Tests

## Testing the operations (black box testing)

### 1. Certain cases. A point is contained by 1 shape.

- a. test1.txt - Point (0,0) contained by a circle with center (1,1) and radius 2.
- b. test2.txt - Point (0,0) contained by a square with center (1,1) and side length 2.
- c. test3.txt - Point (0,0) contained by a regular triangle with center (0.5, 0.5) and side length 2
- d. test4.txt - Point (0,0) contained by a hexagon with center (1,1) and side length 3.

### 2. A point is contained at the edge of 1 shape.

- a. test5.txt - Point(1,1) contained by a circle with center (2,1) and radius 1.
- b. test6.txt - Point (1,1) contained by a square with center (0,0) and side length 2.
- c. test7.txt - Point (1,1) contained by a regular triangle with center (1, 1.1) and side length 1
- d. test8.txt - Point (1,1) contained by a hexagon with center (1,2) and side length 2.

### 3. A point is contained by all the given shapes.

text9.txt – Point (0,0) contained by circle(1,1,3), square(2,2,5), triangle(0,1,5), hexagon(-1,-1,6)

**4. A point is not contained by all the given shapes.**

text10.txt – Point(0,0) is not contained by circle(10,10,3), square(20,2,2), triangle(10,1,1), hexagon(-3,-10,2)

**Testing based on the code (white box testing)**

**1. FileNotFoundException**

Invalid.txt - An invalid file name is given as a file name. This invokes FileNotFoundException and outputs a message.

**2. EmptyFileException (test11.txt)**

If the given file is empty, EmptyFileException is invoked and outputs a message.

**3. NullPointerException (test12.txt)**

If the number of shapes does not match with the number on the first line, NullPointerException is invoked and outputs a message.

**4. IndexOutOfBoundsException (test13.txt)**

If the number of entries per line is not equal to 4, IndexOutOfBoundsException is invoked and outputs a message.

**5. InvalidInputException (test14.txt)**

If the line is not started with one of these letters "c, s, t, h, C, S, T, H". InvalidInputException is invoked and outputs a message.