HOMEWORK 20

CS 125

due at 12:45pm (classtime) on Thursday, November 5

This assignment requires you to create a hierarchy of classes for geometric shapes, such as rectangles, triangles. Prepare your solutions in a single Python file or Colab notebook. Use comments to clearly label your work. Provide test cases to show that your methods produce the desired output. Submit your file or Colab notebook link to the Homework 20 assignment on Moodle.

1. **Parent class: `Shape`.** Create a `Shape` class that will store common properties of shapes, and that will be inherited by classes for specific types of shapes. At minimum, the `Shape` class should contain one attribute: a base point, which will specify the location of the shape in the *xy*-plane. The base point should be implemented as a `Point` object from the online text. The `Shape` class should have an initializer method that sets the base point, a `move` method that modifies the base point, and a `__str__` method that provides a text representation of the `Shape`.

2. **Rectangles**: Create a `Rectangle` class which is a child class of `Shape`, according to the following specifications.
   a. The base point from the `Shape` class should specify the lower-left corner of the rectangle.
   b. The `Rectangle` class should have height and width attributes, and methods to return its area and perimeter (as last time).
   c. Override the `__str__` method to return a text representation of the `Rectangle`.
   d. Also write a `plot` method that returns a Matplotlib plot of the `Rectangle`.
   e. Optionally, add a rotation angle attribute that allows you to specify a rectangle whose sides are not parallel to the coordinate axes, and update your `plot` method to take this into account.

3. **Triangles**: Create a `Triangle` class which is also a child class of `Shape`, according to the following specifications.
   a. You may decide how to store the information necessary to specify a triangle, but your implementation should make use of the base point from the `Shape` class.
   b. Create methods that return the area and perimeter of the triangle. (*Hint:* Heron's

formula computes the area of a triangle from its side lengths. There are also other ways to compute the area of a triangle.)

c. Also write a `plot` method that returns a Matplotlib plot of the Triangle.

4. **Another type of shape**: Create one more child class of `Shape` that implements another type of shape that you choose. Implement several methods of your choice, including a `plot` method that returns a Matplotlib plot of your shape.