Activities: Python Inheritance

1. Create a class Point. This class models a point in the plane. The repr dunder for point `a = Point(1, 2)` should return <Point: x=1, y=2>. Then add a method that calculates the distance to another point as well as a dunder abs that calculates the distance between the point and the origin.

```
class Point:
    '''simple class to implement points in the
       Euclidean plane.
    '''
    def __init__(self, x, y):
        self.x = x
        self.y = y
    def __str__(self):
        return '({},{})'.format(self.x, self.y)
    def __repr__(self):

    def distance(self, other):

    def __abs__(self):
```

2. Add a class Polygon. A polygon is a list of points. Calculate the circumference of the polygon as the sum of the distances between consecutive points in the list, starting with Point 0 and ending with Point 0.

```
class Polygon:
    '''
    A polygon is essentially a list of points.  Few calculations
can
    be made for polygons themselves, so it is a base class.
    '''
    def __init__(self, list_of_points):
        self.lopoints = list_of_points
    def __str__(self):
        return '<->'.join([str(pt) for pt in self.lopoints])
    def __repr__(self):

    def circumference(self):
```

3. Derive a class Triangle from Polygon. Add a function that calculates the area of a triangle using Heron's formula for the triangle. For this formula, you first calculate the distances a, b, c among the points that form the triangle, and then you calculate $s = \frac{a+b+c}{2}$, and finally the area as $\sqrt{s(s-a)(s-b)(s-c)}$.

```
class Triangle(Polygon):
    def __init__(self, list_of_points):
        if len(list_of_points)==3:
            super().__init__(list_of_points)
        else:
```

```
                raise ValueError
        def area(self):
```

4. Notice that the class definition of Triangle does not have a string or represention dunder, but that you can still print out or represent triangles and also calculate the circumference. Try this out using the following test code:

```
if __name__ == '__main__':
    triangle = Polygon([Point(0,0), Point(1,2), Point(2,1)])
    print(triangle, triangle.circumference())
    triangle = Triangle([Point(0,0), Point(1,2), Point(2,1)])
    print(triangle, triangle.circumference(), triangle.area())
```