CPSC 250 Test 3

Question 1: Vehicle Collection (10 points)

The goal of this question is to implement a program to manage an antique car collection.

Step 1. You are given templates for a base Vehicle class and derived Car, Truck classes. You will need to complete the \_\_init\_\_ and display\_info() functions for these classes.

Step 2. Write a main program to create a list called my\_collection.

Step 3. Given some input data (example below), store objects that belong to the appropriate classes in the list created in Step 1.

Step 4. Create a function (called by the main program) with the name display\_list() that uses the display\_info() instance methods defined in the respective classes and prints each element in my\_collection.

In summary, the main program should read vehicles from input (ending with done), add each vehicle to the my\_collection list, and output each element in my\_collection using the display\_info() function.

(See the next page for an input/output example)

Ex. If the input is:

vehicle Vespa 7800

car Chevrolet 27000 BelAir 1957

truck Fargo 22500 Pickup 1948 false

vehicle Scooter 200

done

the output is:

Vehicle 1 Information:

Vehicle Make: Vespa

Value: 7800

Vehicle 2 Information:

Description: 1957 Chevrolet BelAir

Value: 27000

Vehicle 3 Information:

Description: 1948 Fargo Pickup

Value: 22500

All Wheel Drive: false

Vehicle 4 Information:

Vehicle Make: Scooter

Value: 200

Question 2: Shapes (20 points)

This question is all about creating classes that represent various geometrical shapes.

Step 1: Create a base class called Shape.

It should have one private instance variable of type integer and named number\_of\_sides.

It should have a constructor (i.e. \_\_init\_\_) that takes one argument, the number of sides.

Define the number\_of\_sides instance variable in the constructor body.

Create a method named calculate\_area that takes no arguments and just passes (no implementation).

Create another method named

calculate\_perimeter that takes no arguments and just passes (no implementation).

Create a setter method named set\_number\_of\_sides that takes one argument (the number of sides), and returns nothing.

Create a getter method named get\_number\_of\_sides that takes no arguments, and returns the number of sides.

Step 2: Create a derived class (of the base Shape class) called Rectangle

It should have two private instance variables,

a float named width and a float named height.

Create a constructor (\_\_init) that takes three arguments:

number\_of\_sides, width, and height. Fulfill the constructor requirement of the parent class. Define the width and height instance variables in the constructor body.

Implement the calculate\_area method.

- Area of a rectangle is calculated as: area = width \* height

Implement the calculate\_perimeter method.

- Perimeter of a rectangle is calculated as: perimeter = 2(width) + 2(height)

Create appropriate getters and setters: set\_width, get\_width, set\_height, get\_height

Create an appropriate \_\_eq\_\_ method (one rectangle would be equal to another rectangle if (and only if) BOTH the heights and widths are equal to one another.

Create a \_\_str\_\_ method to return a string in the following format (where x is the appropriate value):

"A rectangle has x sides | Area = x | Perimeter = x"

Step 3. Create a class named Circle that is a child of Shape

It should have one private instance variable, a float

named radius.

Create a constructor that takes two arguments, number\_of\_sides, and radius. Fulfill the

constructor requirement of the parent class. Define the radius instance variable in the constructor body.

Implement the calculate\_area method.

- Area of a circle is calculated as: area = PI \* radius^2

Implement the calculate\_perimeter method.

- Perimeter (circumference) of a circle is calculated as: perimeter = 2 \* PI \* radius

Create appropriate getters and setters: get\_radius, set\_radius

Create an appropriate \_\_eq\_\_ method. One circle is considered equal to another circle if (and only if) the radii are equal to one another.

Create a \_\_str\_\_ method to return a string in the following format (where x is the appropriate value):

"A circle has x sides | Area = x | Perimeter = x"

You may find the following main program helpful to test your classes; the expected answers are included as comments in the code!

if \_\_name\_\_ == '\_\_main\_\_':  
 rectangle = Rectangle(4, 4.1, 2.3)  
 print(rectangle) # 4 sides, area=9.43, perimeter=12.8  
  
 circle = Circle(1, 3.5)  
 print(circle) # 1 side, area=38.48, perimeter=21.99  
  
 print()  
  
 shapes = [  
 Circle(1, 3.2), # 1 side, area=32.17, perimeter=20.11  
 Rectangle(4, 2, 2.6), # 4 sides, area=5.20, perimeter=9.20  
 Circle(1, 8.3), # 1 side, area=216.42, perimeter=52.15  
 ]  
  
 for shape in shapes:  
 print(shape)  
 print()  
  
 rectangle2 = Rectangle(4, 1, 1)  
 rectangle2.set\_length(2)  
 rectangle2.set\_width(4)  
 print(rectangle2) # 4 sides, area=8, perimeter=12  
 print(rectangle2.get\_length()) # 2  
 print(rectangle2.get\_width()) # 4  
  
 circle2 = Circle(1, 1)  
 circle2.set\_radius(2)  
 print(circle2) # 1 side, area=12.57, perimeter=12.57  
 print(circle2.get\_radius()) # 2  
 print()  
  
 print(rectangle2 == Rectangle(4, 4, 2)) # False  
 print(circle2 == Circle(1, 2)) # True