**GR 5072 Activity**

1. Create a new class called **Rocket**. Write and save your new class as a module (i.e., a file with a .py extension). This Rocket class is defined below.

   Let's suppose you are creating a rocket ship in a game, or in a physics simulation. This class should have the following properties:

   - The first thing you must track are the x and y coordinates of the rocket. These are just (x, y) coordinates that locate the rocket in 2D-space. When a new instance of a Rocket class is initialized, the user will input x and y parameters to locate the rocket in 2D space. If no coordinates are provided, then set the x and y coordinates to (0, 0) by default
   - The first behavior to define is moving the rocket. If the rocket moves in the y direction, we say that it moves up or down, and its y coordinate must be adjusted. If it moves left or right, we will adjust its x coordinate. Create a **move_rocket** method which moves the rocket in both the x and y direction (You should use a default movement of 0 if the x or y movement is not specified)
   - Add a method which can calculate the distance to another rocket. You can use the distance formula:

     ```
     sqrt((self.x-other_rocket.x)**2+(self.y-other_rocket.y)**2)
     ```

2. Once you've created the Rocket class above and saved it as a module, open another blank python script and import your rocket class. We will then be able to create some objects based on this new class. Do the following:
   - Initialize a new rocket, don't add any arguments. Check that the x and y attributes are correctly set to (0, 0).
   - Create a second rocket, and place it at the coordinates (10, 5). Check its attributes to confirm it is working.
   - Move the rocket located at (10, 5) by the increment (-7, -1). Look at the rocket's position. Is it located at the right place?
   - After moving the second rocket which you created as specified above, what is the distance between this rocket and the first rocket?

3. Create a new class called **Shuttle.** The Shuttle class should inherit all of Rocket's characteristics but has one additional parameter: *flights_completed* which measures the number of flights the shuttle has completed. Define the shuttle class as the child of the rocket class in the same module where you created the Rocket. Import this class, and create a new object based on the Shuttle class.

   Once you've created a Shuttle, print the following message: "The shuttle is located at (__, __), and has recorded __ flights", filling the blank spaces to reflect the information for the Shuttle you just created.

4. Write two different for loops, once that randomly creates 10 rockets using randomly generated integers, and another that randomly creates 10 shuttles. Store your output in two separate lists. You can use the **randint** function from the **random** module (from random import randint) to randomly set the characteristics of your Rockets and Shuttles.

   For the Shuttles you created, loop through them and print the following messages to the iPython console (*Hint:* use the enumerate function in your for loop!)

```
Shuttle 0 has completed 3 flights.
Shuttle 1 has completed 0 flights.
Shuttle 2 has completed 7 flights.
Shuttle 3 has completed 9 flights.
Shuttle 4 has completed 1 flights.
Shuttle 5 has completed 8 flights.
Shuttle 6 has completed 6 flights.
Shuttle 7 has completed 5 flights.
Shuttle 8 has completed 5 flights.
Shuttle 9 has completed 2 flights.
Shuttle 10 has completed 4 flights.
```

   For the Rockets you created, print out the following output using a for loop.

```
The first shuttle is 0.0 units away from shuttle 0.
The first shuttle is 85.23 units away from shuttle 1.
The first shuttle is 15.26 units away from shuttle 2.
The first shuttle is 39.32 units away from shuttle 3.
The first shuttle is 30.89 units away from shuttle 4.
The first shuttle is 26.4 units away from shuttle 5.
The first shuttle is 49.04 units away from shuttle 6.
The first shuttle is 43.08 units away from shuttle 7.
The first shuttle is 53.46 units away from shuttle 8.
The first shuttle is 67.03 units away from shuttle 9.
The first shuttle is 41.44 units away from shuttle 10.
```

   Because the Rocket class is a parent of the Shuttle class, we can compare them since they share some of the same properties. Print the output below using a for loop.

```
The first shuttle is 76.24 units away from rocket 0.
The first shuttle is 60.53 units away from rocket 1.
The first shuttle is 33.96 units away from rocket 2.
The first shuttle is 23.09 units away from rocket 3.
The first shuttle is 21.26 units away from rocket 4.
The first shuttle is 16.97 units away from rocket 5.
The first shuttle is 46.75 units away from rocket 6.
The first shuttle is 30.41 units away from rocket 7.
The first shuttle is 47.27 units away from rocket 8.
The first shuttle is 48.17 units away from rocket 9.
The first shuttle is 40.31 units away from rocket 10.
```