

Informatics for Astronomers - WS2020

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Exercise sheet 9 - Python classes, HTML & SQL

The following will be also part of the assessment:

(1) Try to present exercises in a way that everyone can understand (even those who didn't do the exercises), so please explain the vital parts of your solution in a clear way.

(2) Try to also include some background information where applicable, and/or explain the possible context/motivation for the given exercise.

1. Consider a class that defines a circumference.

```
class Circle:
    def __init__(self, radius):
        self.radius = radius
```

Besides radius, a circumference should have attached the following properties/attributes that derive from the radius:

- perimeter
- area

Please implement them (there are a few ways to do it). Save the the class in a .py file and import it from another (or from a Jupyter notebook) and show how the class works by doing a few calculations.

2. In Exercise 6, question 2, you created functions to calculate the distance, the dot and cross products of vectors. Please transform these functions into class methods of a new class Vector so we can perform the following operations as:

```
v1 = Vector(list1)
v2 = Vector(list2)

value1 = v1.distance(v2) # a float
value2 = v1.dot(v2)      # another float

v3 = v1.cross(v2)        # another Vector check with
isinstance(v3, Vector)
> True
```

3. Stars are very important astrophysical objects whose main properties and subsequent evolution are determined at the time of birth. Please structure the skeleton of a class that describe a star at any point during its evolution. *Do not implement any actual calculation.* The purpose of the exercise is to think how to structure python classes. The class should look like that,

```
class Star:
    def __init__(self, parameters):

        # Important attributes

    def method1(self, some_parameters):
        return result1

    def method2(self, other_parameters):
        return result2

# Etc
```

Think about which are parameters necessary to initialize the class or from an astrophysical perspective, the most fundamental property (-ies) of a star that determine the rest of their characteristics. Sketch those characteristics as attributes, methods and properties.

4. Please create (with an editor) a simple webpage that includes some pictures, text and links to your favorite website.
 - Open the webpage with your browser and show us the source.
 - Now go to <http://www.google.com> and show us the source code.

Opinions?

5. The Sloan Digital Sky Survey has produced catalogs of millions of objects on the sky. These catalogs are stored in SQL databases and are easily accessible through their webpages.

For example, <http://skyserver.sdss.org/dr15/en/tools/search/radial.aspx> allows to search of objects within a certain distance from the central position. In reality that web page execute a SQL command, which is also shown along the results of the query.

Using the SQL form <http://skyserver.sdss.org/dr15/en/tools/search/sql.aspx> is possible to execute arbitrary queries. Copy the previous command here and execute it again. Play a bit with the parameters.

- What is the advantage of the “pure” SQL form in comparison with the radial form used at the beginning?
- What do you think about the SQL syntax?
- Is possible to access SQL databases with python?