

## Lab 02

### Object-Oriented Programming

#### A. Multiple Choice (24 points, 6 points each question)

1. In Python, a class is \_\_\_\_\_ for a concrete object.  
(a) an instance (b) a nuisance  
(c) distraction (d) a blueprint
2. The correct way to instantiate the following `Dog` class is:

```
class Dog:
    def __init__(self, name, age):
        self.name = name
        self.age = age
```

- (a) `Dog("Rufus", 3)` (b) `Dog.__init__("Rufus", 3)`  
(c) `Dog.create("Rufus", 3)` (d) `Dog()`
3. In Python, a function within a class definition is called a:  
(a) a callable (b) an operation (c) a method  
(d) a factory (e) a class function
  4. What's the output of the following code snippet?

```
>>> class Dog:
...     def walk(self):
...         return "*walking*"
...
...     def speak(self):
...         return "Woof!"
...
>>> class JackRussellTerrier(Dog):
...     def speak(self):
...         return "Arff!"
...
>>> bobo = JackRussellTerrier()
>>> bobo.speak()
```

- (a) `*walking*` (b) `Arff!`  
(c) `Woof!` (d) `CanineError: Dog malfunction`

#### B. Reading and Programming (24 points, 6 points each question)

The `datetime` module provides time objects that are similar to the `Time` objects in the class, but they provide a rich set of methods and operators. Read the following article and complete the `#TODO` part in `Lab02_B.py`.

Using Python `datetime` to Work With Dates and Times (<https://realpython.com/python-datetime/>)

The documentation can be found at <http://docs.python.org/3/library/datetime.html>.

1. Use the `datetime` module to write a program that gets the current date and prints the day of the week.
2. Write a program that takes a birthday as input and prints the user's age and the number of days, hours, minutes and seconds until their next birthday.
3. For two people born on different days, there is a day when one is twice as old as the other. That's their Double Day. Write a program that takes two birth dates and computes their Double Day.
4. For a little more challenge, write the more general version that computes the day when one person is  $n$  times older than the other.

### C. Spot the Bug (26 points)

This exercise is a cautionary tale about one of the most common, and difficult to find, errors in Python.

1. The `Array` class in `Lab02_C.py` is a self-defined sequential data type. Look at the code in the `main` function to see how the `Array` class works then complete the class definition. (Hint: you have to add two special functions) **(10 points)**
2. The program contains a BIG, NASTY BUG that could be seen after printing `arr2`. Find and fix the bug directly in `Lab02_C.py`. Remember to explain the problem and how you fix it in the document (.pdf). **(16 points)**

### D. MyEnumerate (26 points)

The built-in `enumerate` function allows us to get not just the elements of a sequence, but also the index of each element, as in:

```
for index, letter in enumerate('abc'):
    print(f"{index}: {letter}")
```

Create your own `MyEnumerate` class, such that someone can use it instead of `enumerate`. It takes a `data` list and a `label` list as parameters, and returns a tuple containing 3 elements each iteration. Find the usage example in the `main` function in `Lab02_D.py` and complete the `MyEnumerate` class.