CSIT121 Lab Exercises

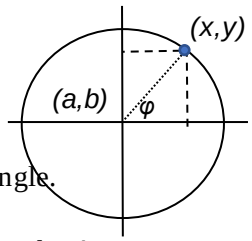
Lab 1

Objectives

- Get familiar with the Python development environment
- Get familiar with OOD and represent your OOD as a UML class diagram
- 2 exercises

Exercise 1: In the (x,y) Cartesian coordinate space, the coordinates of a circle centred at the point (a, b) can be calculated as

$x = r \times \cos \varphi + a$
$y = r \times \sin \varphi + b$



where r is the radius, and φ is the degree of the angle.

The area of the circle can be calculated by the formula: Area = $r \times r \times PI$
The circumference of the circle can be calculated by the formula: Circumference= $2 \times r \times PI$

Design and implement classes with UML and Python to complete the following tasks:

1. Create a circle based on the coordinate of the circle's centre (a, b) and radius (r) from the user's inputs.
2. Calculate and print the area and the circumference of the circle.
3. Calculate and print the coordinate of the point on the circle based on the angle (φ) from the user's input.

Hints:
Step 1: (OOA): analyse the requirements and consider the possible classes and class members.
Step 2: (OOD): draw a UML class diagram to represent your design.
Step 3: (OOP): implement your design with Python and test your program.
Step 4: repeat Steps 1 to 3 to refine your design and implementation if your program's outputs are incorrect or do not align with the requirements.
Step 5: use the '__name__' variable to ensure your testing cases are only executed in the command prompt/terminal.
Step 6: save your Python program with the file name 'Circle.py'.

Exercise 2: Design and implement a system (using OO concepts, UML and Python) to maintain students' subject enrolment records. One student can enrol in multiple subjects, and each subject can contain many students but just one teacher. The system allows the user (as an admin) to create/modify subjects, teachers, and student objects, allocate each subject to a teacher or modify the subject teacher, and enrol students to subjects or modify the subject students. The system can search and display 1) the subject and subject details (subject name, subject teacher, enrolled students) based on the subject code, the student and student details (student name, student ID, enrolled subjects) based on the student ID, and the teacher and teacher details (teacher name, taught subjects) based on the staff ID.

Hints:
Step 1: (OOA): analyse the requirements and consider the possible classes and class members.
Step 2: (OOD): draw a UML class diagram to represent your design.
Step 3: (OOP): implement your design with Python and test your program.
Step 4: repeat Steps 1 to 3 to refine your design and implementation if your program's outputs are incorrect or do not align with the requirements.
Step 5: use the '__name__' variable to ensure your testing cases are only executed in the command prompt/terminal.
Step 6: save your Python program with the file name 'EnrolmentSystem.py'.