Assignment 06

Spring 2023 OOP (due: 24-12-23)

TASK 1

You need to create a comprehensive class for an n-dimensional vector. Write its test cases too. Like, 2 dimensional and 3 dimensional vectors, the 4 dimensional and 5 dimensional and dimensional vectors also exist, which are natural extensions of the 2 and 3 dimensional vectors. For examples, vector is a tuple $v = (x_0, x_1, x_2, \dots, x_{n-1})$ having magnitude and dot product of two n-dimensional vectors are as follows:

$$|v| = \sqrt{x_0^2 + x_1^2 + x_2^2 + \cdots + x_{n-1}^2}$$

$$|v_a . v_b| = x_{a0}x_{b0} + x_{a1}x_{b1} + x_{a2}x_{b2} + \cdots + x_{a(n-1)}x_{b(n-1)}$$

You may even imagine there is one dimensional vector, which in fact are just numbers. Their magnitude and dot product are as $\sqrt{x_0^2}$ and $x_a x_b$.

TASK 2

Comprehensively demonstrate the working of multiple inheritance using person, student, teacher and TA classes. The person can have a name: string and contact numbers: string as attributes, students have department: string and semester: int as attributes, teacher has course: string and office number: int as attributes. The TA can behave like a student as well as a teacher.

TASK 3

Create an appropriate shapes hierarchy with shape as an abstract class with abstract functions like area, etc. Inherit rectangle and circle classes from shape and implement abstract functions of shape in them. Later inherits square from rectangle and oval from circle classes. The former re-uses the attributes and functions of it base, while later extends itself with its own additional attributes and area like functions. You need to comprehensively demonstrate POLYMORPHISM. Also, using the **tkinter** canvas, draw shape on the graphical window.