
Revision Tutorial

Problem 1

Case Study

School of Computing will be organizing a competition that is open to all UTM students. The goal of this competition is that to provide a platform to the students to exhibit their idea. The details of the the competition are as follows:

- It is an individual participation.
- Each student must have a project beforehand.
- Each student must find an advisor which can be any of the UTM staffs regardless of their position. That means, besides lecturers, technicians, research officers, etc, also can be appointed as advisers.
- Only one advisor is allowed for each student.
- However, a staff can advise more than one student.

Question

- a. Draw the class diagram showing the classes and their relationships for the above case study. Note that, provide only the name and the attributes for each class (the methods are not required).

Tips: the diagram should have these classes: Person, Contact, Advisor, Student, and Project.

- b. Complete the given template source code, **program1.cpp** to implement all the classes. For each class, define only one constructor to initialize the attributes with values passed via the parameters. You do not need to include other methods (except for the class Student).

As for the class `Student` add the following mutators and accessors:

- `setProject, setAdvisor`
- `getEmailAdress, getProjectTitle, getAdvisorName`

Problem 2

Case Study

Rectangle and triangle are two common types of polygons. They can be represented by their dimensions, w and h . As for a rectangle, w represents the width and h is the length of the rectangle. Whereas for a triangle, w and h are the base and height of the triangle, respectively (refer to Figure 1).

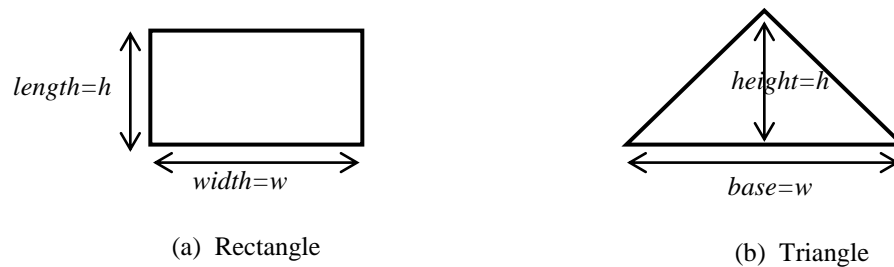


Figure 1: Representation of a rectangle(a) and triangle (b).

The area of each polygon is then calculated by:

Rectangle's area = width x length

Triangle's area = $\frac{1}{2}$ (base x height)

Question

- Generalization is one of the uses of **inheritance**. Based on the above case study, identify which parts of these polygons can be implemented with the concept of **generalization**. Justify your answer.
- Identify which parts of these polygons can be implemented with the concept of **polymorphism**. Justify your answer.
- Complete the given template source code, **program2.cpp** based on the following tasks:

Task 1: Implement all the classes including their relationships.

Task 2: Declare an array to hold rectangles and triangles.

Task 3: Fill in the array with some rectangles and triangles. Note that, the objects can be created with hard-coded attributes.

Task 4: Print all the rectangles and triangles onto the screen as well as the total area. Refer to Figure 2 for the program output.

You may want to add other classes, attributes or methods whenever necessary.

```
Polygon #1
Triangle:
    Base = 10, Height = 20
    Area = 100

Polygon #2
Rectangle:
    Width = 20, Length = 20
    Area = 400

Polygon #3
Rectangle:
    Width = 15, Length = 10
    Area = 150

Polygon #4
Triangle:
    Base = 20, Height = 20
    Area = 200

The total area of all polygons = 850
```

Figure 2: Program output.