

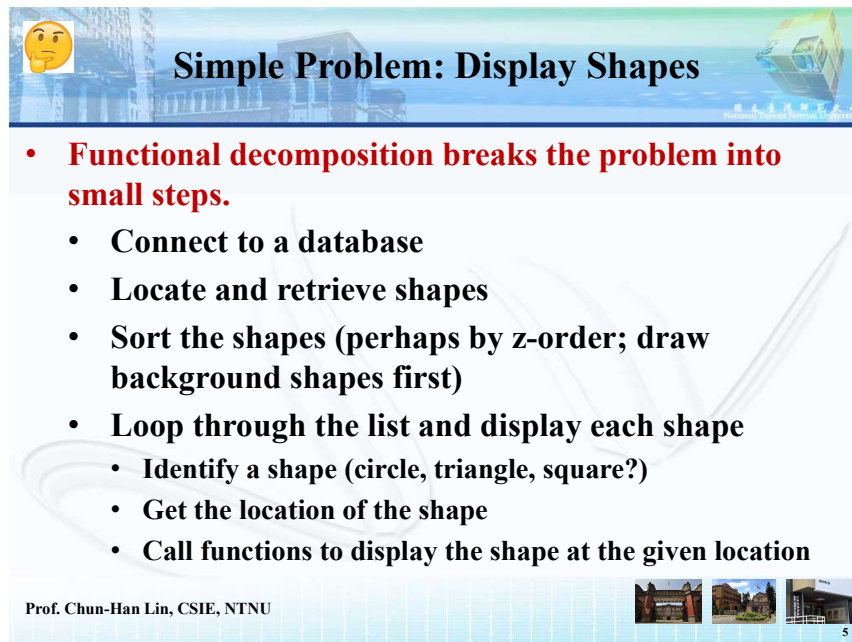
National Taiwan Normal University  
Department of Computer Science and Information Engineering  
CSC0005, Homework 1

## 1 Information

1. The homework is worth 100 points.
2. Individual or team (2-5 people) work, and each person can be individual or join one team.
3. Due at 12:00 on 3/13, i.e., Thursday noon.
4. Submit one compressed file which contains a report and programs to the course website.
5. Submit one copy if you work in a team, and then you will be graded as a team.
6. Write the report in English or Chinese MS Word or PDF format.
7. Put the programs in a single directory.
8. Make sure programs are runnable.

## 2 Contents

1. Provide definitions for the following terms. How does each of the terms apply to OO notion of classes? Provide examples of both good and bad uses of the terms in a design of a class or a set of classes.
  - (a) (15 points) Abstraction
  - (b) (15 points) Encapsulation
  - (c) (15 points) Cohesion
  - (d) (15 points) Coupling
2. (40 points) Write a simple OO program that implements the example Shape in slide 5 of Chapter 1, shown in Fig. 1, but using an OO approach rather than the presented functional decomposition solution. Your program should simply print out (to a console) the number of shapes in a “database” and then ask each shape to “display itself” which will also cause a line of output to be generated to the console, one line for each shape. The word “database” is in quotes because you should not actually use a database in the program. It is perfectly acceptable to create a collection of shapes in a main program before sorting the collection and displaying shapes. Your program should support circles, triangles, and squares, but should use polymorphism so that the main program doesn’t know the type of the shape that it is dealing with, but instead treats all shapes uniformly.



**Simple Problem: Display Shapes**

- **Functional decomposition breaks the problem into small steps.**
  - **Connect to a database**
  - **Locate and retrieve shapes**
  - **Sort the shapes (perhaps by z-order; draw background shapes first)**
  - **Loop through the list and display each shape**
    - **Identify a shape (circle, triangle, square?)**
    - **Get the location of the shape**
    - **Call functions to display the shape at the given location**

Prof. Chun-Han Lin, CSIE, NTNU

5

Figure 1: Display shapes

The use of polymorphism is similar to the example code in Chapter 1, which handles different types of students. You may use any OO programming language that you would like to write the program, just be aware that the grader, i.e., the instructor or TA, may have to meet with you if you use a programming environment that he/she does not have access to.

### 3 Teamwork

When working in a team, it is “ok” to assign each question to a different team member to work individually. However, you should make sure that you come together as a team at least once to discuss all answers, and to ensure that a high quality is achieved in each answer.

Of course, you can work as an individual on the assignment if you want, though you will eventually need to join a team to work on a semester project.