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Objective: Classes, Encapsulation, Inheritance

Write a program that defines a base **class** called **COP3014**. The class resembles our own classroom. It has the following grading scheme:

4 assignments	100 points each	25%
Midterm	100 points	30%
Final	100 points	45%

Based on the *total grade* of any student for the course, the letter grade of each student can be computed as follows:

A	90 - 100%
A-	87 - <90%
B+	83 - <87%
B	80 - <83%
B-	77- <80%
C+	73 - <77%
C	70- <73%
C-	67 - <70%
D+	63 - <67%
D	60 - <63%
D-	51- <60%
F	50 or below

This data attributes can be as follows: The first name, last name, the Z-number, the grades, the total grade, and final letter grade can all be considered as *private* member variables of this class.

The class should also have the following *public* member functions/procedural attributes that can provide functionality for the objects of the class:

a. Constructor(s) and default constructor
b. Setter functions
c. Getter functions
d. An input function that asks the user for student's name, Z-number and grades.
e. A function that computes the student's total grade
f. A function that computes the student's final letter grade.
g. An output function which outputs information of any student: including their z-number, and grades on all assignment to the screen or store in a file.

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The next step is to create a *derived class* from **COP3014** and name it **Spring24**. In this new class, a **lab component is added**. The lab component accounts for 10% of the grade.

Use a private member variable to store the lab grade Generate/redefine the following member functions:

- Constructor for the derived class.
- Input function which includes all assessments.
- Output function which now also outputs the lab outcome.
- A redefined function for computing total grade.

Test cases for the class definitions:

Once you generate the class definition with all its function definitions, the next step is to use the classes and generate test cases. First, construct some objects of the derived class. Give them names to represent individual students.

Every student can start off with an initialized total grade of 100 which can be initialized in the constructor (initial value is 100, Canvas starts everyone off with 100) and later updated by the teaching staff.

Importantly, each student gets a total grade and a letter grade which is computed for them automatically.

Sample students along with their information are summarized and displayed below:

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COP3014 (The base case typically has no good use, it's used to derive other classes from)

Frank Fabulous – Z12345678

Assign 1: 90
Assign 2: 94
Assign 3: 0
Assign 4: 70
Midterm: 0
Final: 90
Total grade: 56.38
Final grade: F

Gina Genius – Z98765432

Assign 1: 100
Assign 2: 100
Assign 3: 100
Assign 4: 95
Midterm: 98
Final: 95
Total grade: 96.84
Final grade: A

Spring 24

Sammy Surfer – Z00806783

Assign 1: 90
Assign 2: 94
Assign 3: 75
Assign 4:100
Midterm: 75
Final: 76
Lab: 100
Total grade: 81.59
Final grade: B

Tina Traveler – Z50725032

Assign 1: 100
Assign 2: 100
Assign 3: 91
Assign 4: 50
Midterm: 81
Final: 80
Lab: 50
Total grade: 78.56
Final grade: B-

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Notes:

- Equation to compute total grade for the base class:

```
Total grade = [(assign1 + assign2 +assign3 + assign4)/4.0] * 0.25 + midterm *0.3 +
                                    final * 0.45
```

- Equation for computing the Spring24 total grade:

```
Total grade = [(assign1 + assign2 +assign3 + assign4)/4.0] * 0.25 + midterm *0.25 +
final * 0.4 + lab *0.1
```

- Z-number is 8 digits long (the user doesn't have to enter the letter 'Z'. Just a number is enough)

- Grading policy: Any student who is absent on the final exam would fail the class.

- Also, if a student misses the midterm exam, they can pass at best case with a C. Ensure that this policy is applied to your class definitions.

- Do not use the protected label. Using private and public labels are enough to get the job done.

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