

Lab3B: Calculating Grade

Object and Array List

- This lab exercise is divided into four stages – Stage 1, Stage 2, Stage 3 and Stage 4.
- You need to complete Stage 1 without errors before you can proceed to Stage 2, and complete Stage 2 without errors before you can proceed to Stage 3 and Stage 4.
- For reference (e.g., list of methods in ArrayList class that you can use), you may refer to the following Java documentation:

- ArrayList (Java Platform SE 8):

<https://docs.oracle.com/javase/8/docs/api/java/util/ArrayList.html>

Question:

In FTSM, students take many courses to complete their study. In each course there are two main components for assessment. One component is called a continuous assessment that takes up to 60% of the whole marks. This assessment may include quizzes, tutorials, individual assignment, group project, etc. Another component is final exam, which takes up to 40% of the whole marks. A student must obtain at least 20% for both components to pass a particular course. Lastly, the program can calculate a grade based on both components as well as the overall marks.

Task:

Your tasks are to develop a program to manage the student's information such as name, matrix number, telephone no, as well as marks for individual project, group project (for continuous assessment), and final. These marks are out of 100%. The program can display the number of students that take a course, add a new student to the list, total up the marks for continuous assessments, and calculate the overall marks for the course for each student. Lastly, the program can determine a grade for the course based on student's overall marks, as well as checking whether each student has passed both continuous assessments and final exam components.

Stage 1:

1. Create a Java project named Lab3BStage1.
2. Copy file Tester1.java into your project.

Define a class named Student (in file Student.java) that has:

- i. *Instance variables* to represent firstName, lastName, matrix, phoneNo, individualAssignment, groupProject, and finalExam.
- ii. *Constructor* method which receives seven parameters in (i) and assigns them to the associated instance variables.

Add into the Student class:

- i. A method named getFirstName that returns the instance variable firstName.
- ii. A method named getLastName that returns the instance variable lastName.
- iii. A method named getMatrix that returns the instance variable matrix.
- iv. A method named getPhoneNo that returns the instance variable phoneNo.
- v. A method named getIndividualAssignmt that returns the instance variable individualAssignment.
- vi. A method named getGroupProject that returns the instance variable groupProject
- vii. A method named getFinalExam that returns the instance variable finalExam.

Check your answer by invoking the main method in class Tester1 (just run project as Java Application) and your output should be as follows:

```
STUDENT DETAILS:
First Name: Chan
Last Name: Meiying
Matrix No: A12345
Phone No: 0131234567

Continuous Assessment:
Individual Project:80.0
Group Project:80.1
Final Exam: 99.0
```

*Proceed to Stage 2 only after you have completed Stage 1 without errors.

Stage 2:

1. Create a Java project named Lab3BStage2.
2. Copy file `Tester2.java` into your project.
3. Copy files `Student.java` in Stage 1 into your Stage 2 Java project.

Define a class named `StudentList` (in file `StudentList.java`) that has:

- i. *Instance variables* to hold a list of students, `stdList`.
- ii. *Constructor* method which creates the list of students, `stdList` in (i).

Add into the `StudentList` class:

- i. A method named `getStudentList` that returns the instance variable `stdList`.
- ii. A method named `addStudent` that receives an object from class `Student`. Before adding the object to the list, check if the student is already exists, by checking the matrix number. This method returns `true` if the adding process is successful and `false`, otherwise.

Check your answer by invoking the `main` method in class `Tester2` and your output should be as follows:

```
Addition of a new student: Chan Meiying is successfull
Addition of a new student: Suraya Ahmad is successfull
Addition of a new student: Suraya Ahmad has failed, because this
student is already exist in the list
Total students: 2
```

*Proceed to Stage 3 only after you have completed Stage 2 without errors.

Stage 3:

1. Create a Java project named Lab3BStage3.
2. Copy file `Tester3.java` into your project.
4. Copy files `Student.java` and `StudentList.java` from Stage 2 into your Stage 3 Java project.

Add into the `Student` class:

- i. *Instance variables* to represent `continuousAssessment` (that total up individual assignment and group project) marks, `finalExam40percent` and `allMarks` (assessment marks plus final exam) for the student.

Add into the Student class:

- i. A method named `calculateContinuousAssessment` that sums up both individual assignment and group project (`continuousAssessment`), and calculate both components as 60% of the overall marks. The formula is as follows:

$$(\text{individual assignment} + \text{group project}) / 200 * 60$$
- ii. Assign the calculated value to instance variable `continuousAssessment`.
- iii. A method named `getContinuousAssessment` that returns the instance variable `continuousAssessment`.
- iv. A method named `calculateFinalExam` that calculates the `finalExam` as 40% of the overall marks. The formula is as follows:

$$(\text{final exam} / 100) * 40$$
- v. Assign the calculated value to instance variable `finalExam40percent`.
- vi. A method named `calculateAllMarks()` that sums up `continuousAssessment` and `finalExam40percent`.
- vii. Assign the calculated value to instance variable `allMarks`.
- viii. A method named `getAllMarks()` that returns the instance variable `allMarks`.

Check your answer by invoking the main method in class `Tester3` and your output should be as follows:

```
Addition of a new member: Chan Meiying is successfull
Addition of a new member: Suraya Ahmad is successfull
Addition of a new member: BoiBoiBoy Boya is successfull
Addition of a new member: Gopal Maniam is successfull
Total students: 4
Chan Meiying: Continuous assessment: 48.03, Final exam: 39.6, Overall marks: 87.63
Suraya Ahmad: Continuous assessment: 40.5, Final exam: 39.6, Overall marks: 80.1
BoiBoiBoy Boya: Continuous assessment: 9.3, Final exam: 3.2, Overall marks: 12.5
Gopal Maniam: Continuous assessment: 28.5, Final exam: 19.6, Overall marks: 48.1
```

*Proceed to Stage 4 only after you have completed Stage 3 without errors.

Stage 4:

3. Create a Java project named Lab1-Stage4.
4. Copy file `Tester4.java` into your project.
5. Copy files `Student.java` and `listStudent.java` in Stage 3 into your Stage 4 Java project.

Add into the `Student` class:

- i. *Instance variables* to represent grade representing the student's grade for the course.

Add into the `Student` class :

- i. A method named `calculateGrade` that determines the final grade for the student, based on the continuous assessment marks (`continuousAssessment`), final exam marks (`finalExam40percent`) and `allMarks` (assessment marks plus final exam) for the course. The rules are as follows:

all marks ≥ 85 , grade = A

all marks ≥ 75 , grade = B

all marks ≥ 60 , grade = C

all marks ≥ 39 , grade = D

all marks < 39 , grade = F

The rule also stated that a student will not get an 'F' if and only if the student obtained at least 20% for both continuous assessment and final exam.

- ii. A method named `getGrade` that return the instance variable `grade`.

Add into the `StudentList` class :

- i. A method named `calculateAstudents` that receives an object of type `ArrayList` which represents a list of students, then calculate and returns the total of students that get an A in the course.
- ii. A method named `calculateFstudents` that receives an object of type `ArrayList` which represents a list of students, then calculate and returns the total of students that get an F in the course.

Check your answer by invoking the main method in class Tester4 and your output should be as follows:

```
Addition of a new member: Chan Meiying is successfull
Addition of a new member: Suraya Ahmad is successfull
Addition of a new member: BoiBoiBoy Boya is successfull
Addition of a new member: Gopal Maniam is successfull
Addition of a new member: Boya TokAba is successfull
Total students: 5
Chan Meiying: Continuous assessment: 48.03, Final exam: 39.6, Overall marks: 87.63, GRADE: A
Suraya Ahmad: Continuous assessment: 40.5, Final exam: 39.6, Overall marks: 80.1, GRADE: B
BoiBoiBoy Boya: Continuous assessment: 9.3, Final exam: 3.2, Overall marks: 12.5, GRADE: F
Gopal Maniam: Continuous assessment: 28.5, Final exam: 19.6, Overall marks: 48.1, GRADE: D
Boya TokAba: Continuous assessment: 46.5, Final exam: 3.2, Overall marks: 49.7, GRADE: F
Total students get an A: 1
Total students get an F: 2
```