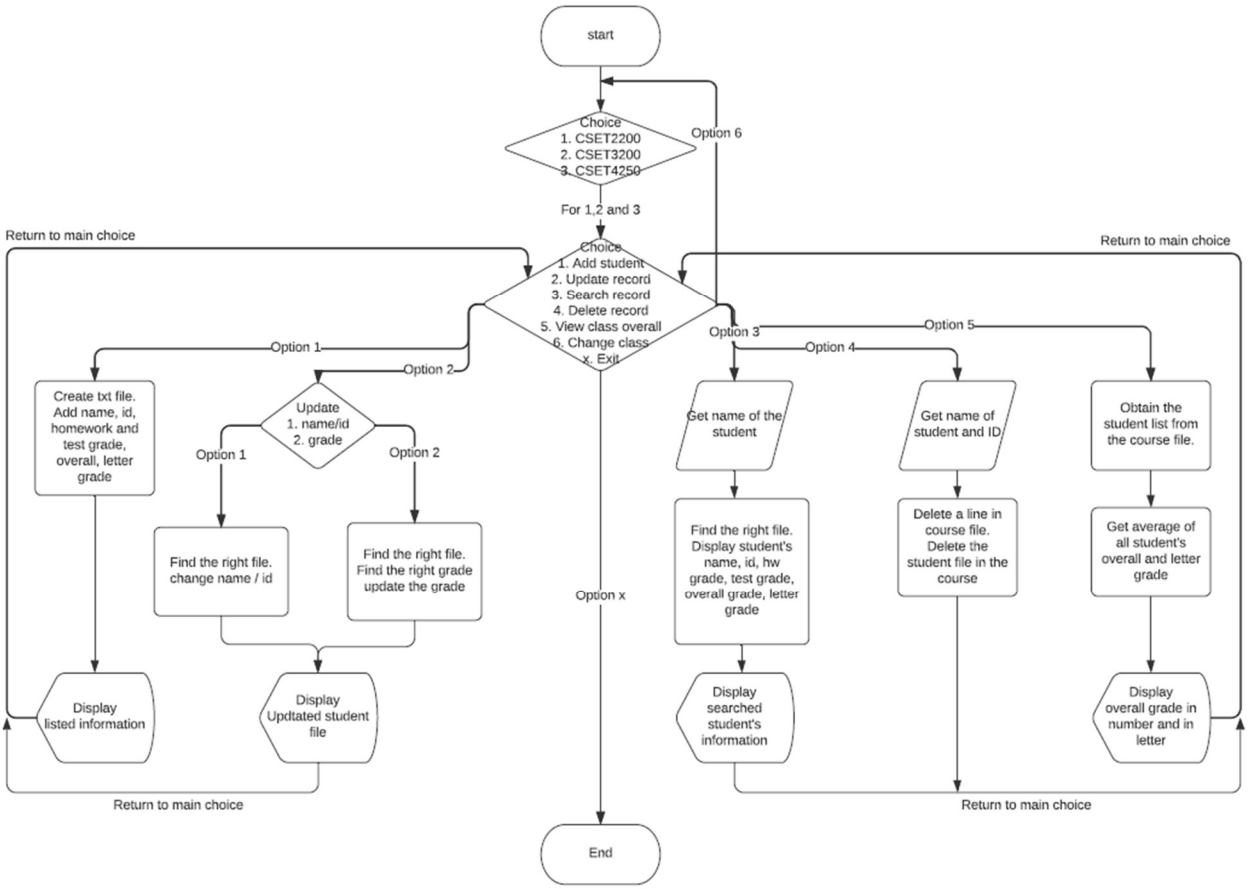
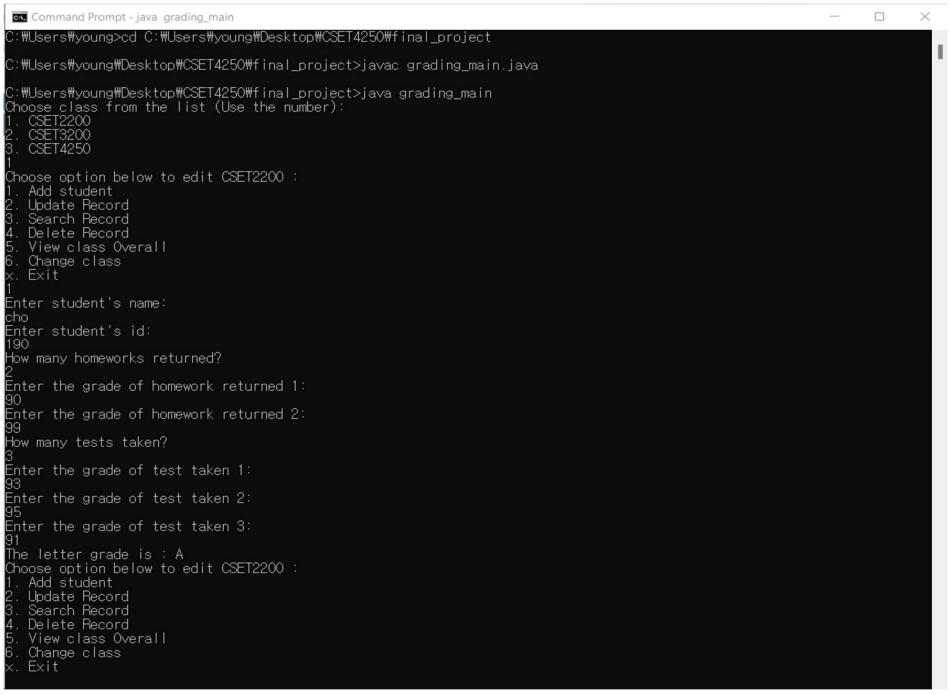
Flowchart

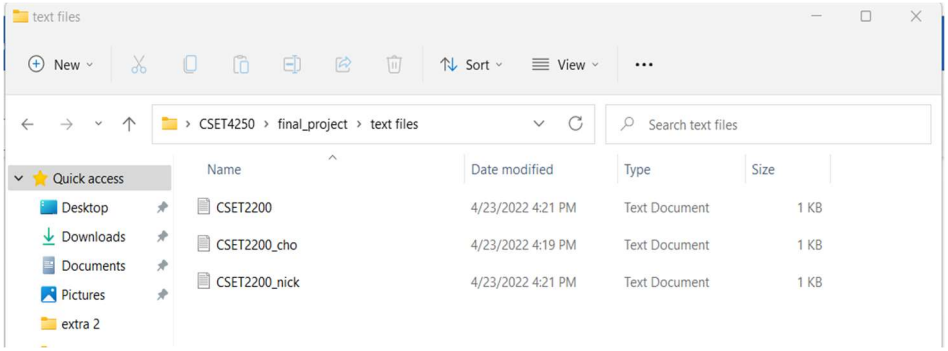


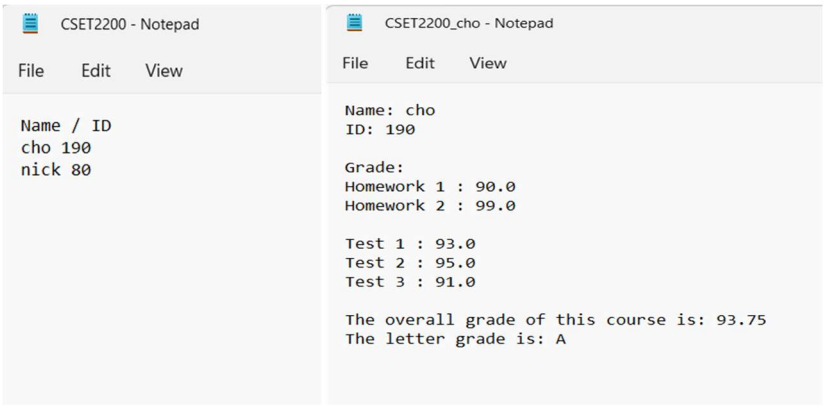
$$\frac{\frac{\text{all homework grade added}}{\text{number of homework grade returned}} + \frac{\text{all test grade added}}{\text{number of test grade returned}}}{2}$$

The equation above is used to calculate the overall grade of a student.

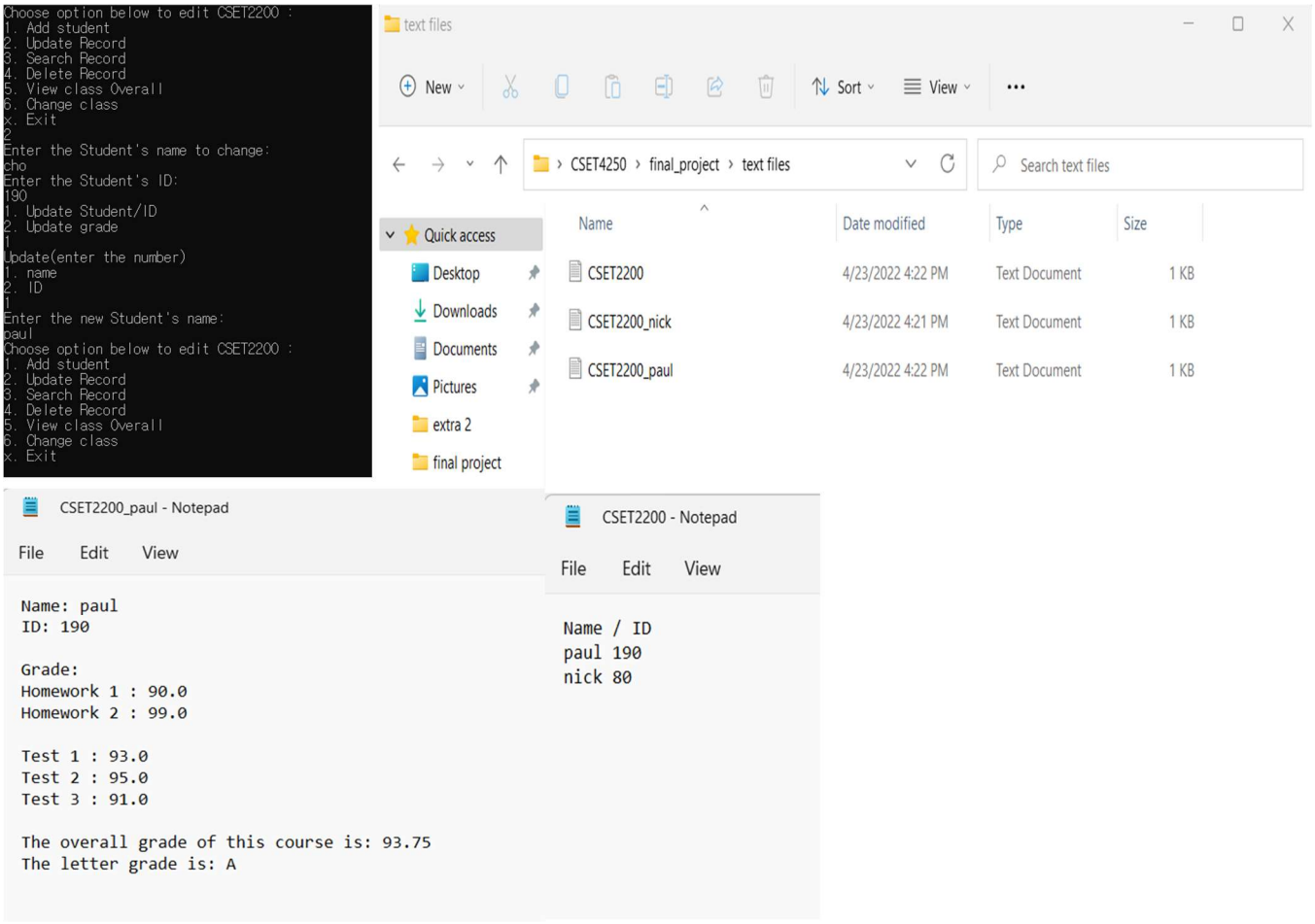
Screenshot of run time program



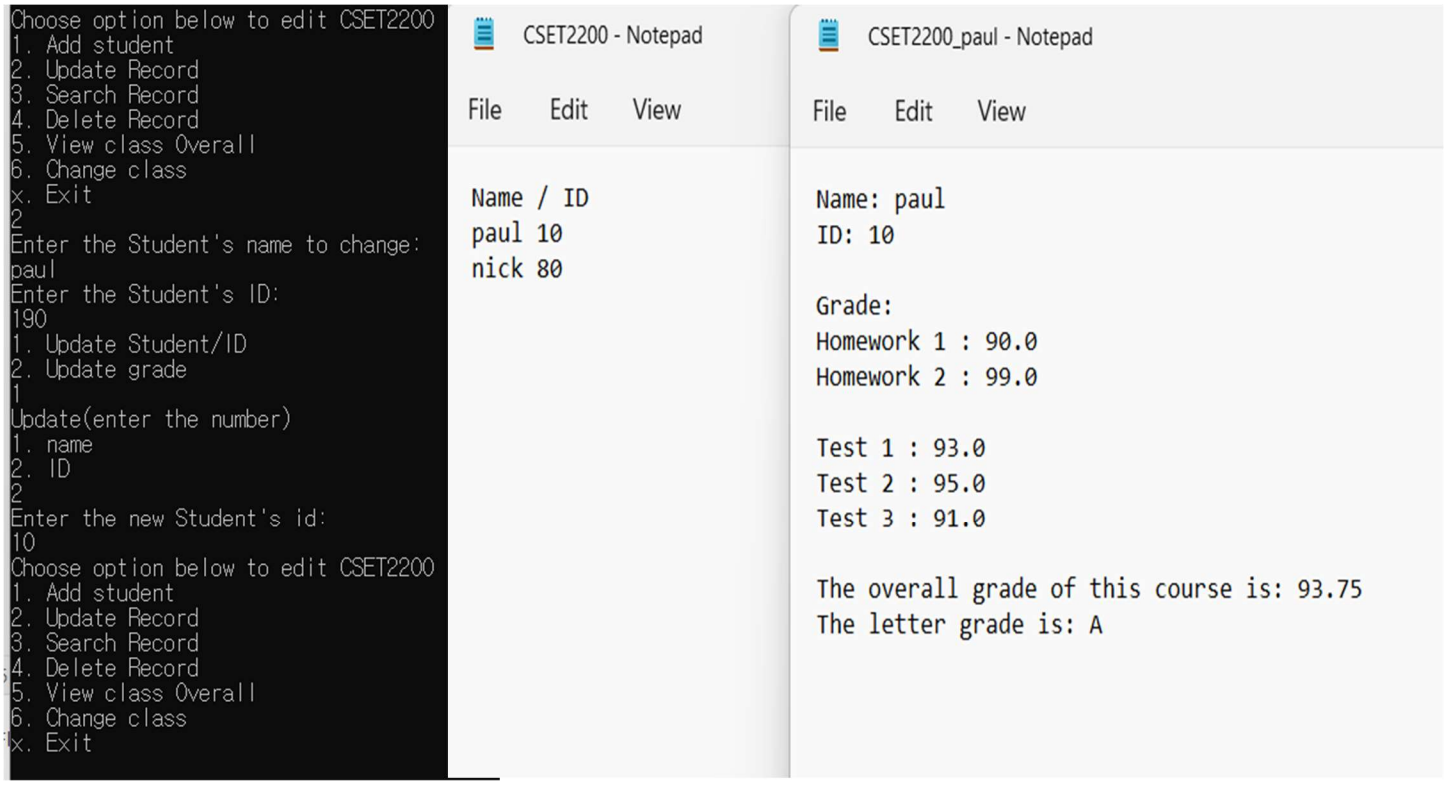




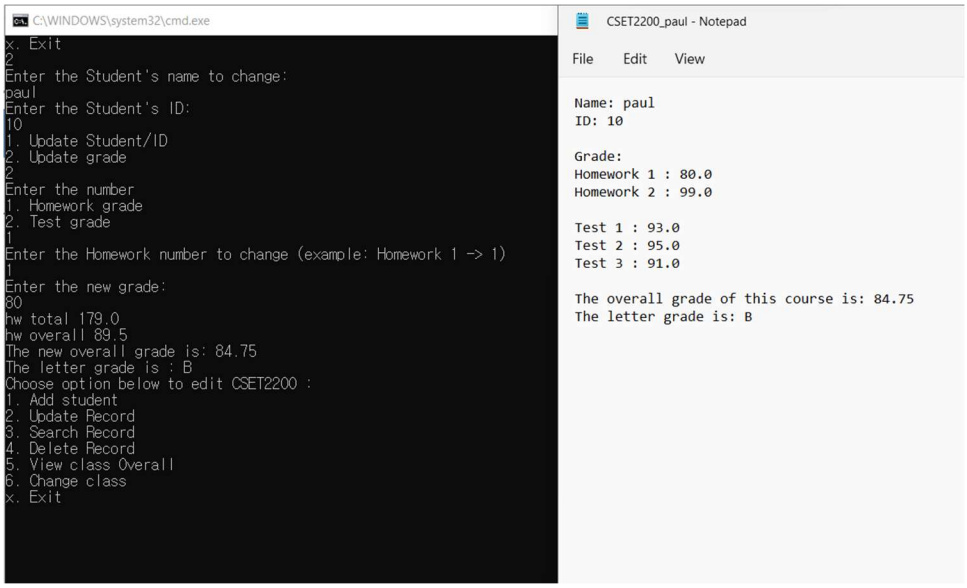
They are the screenshots of add student.



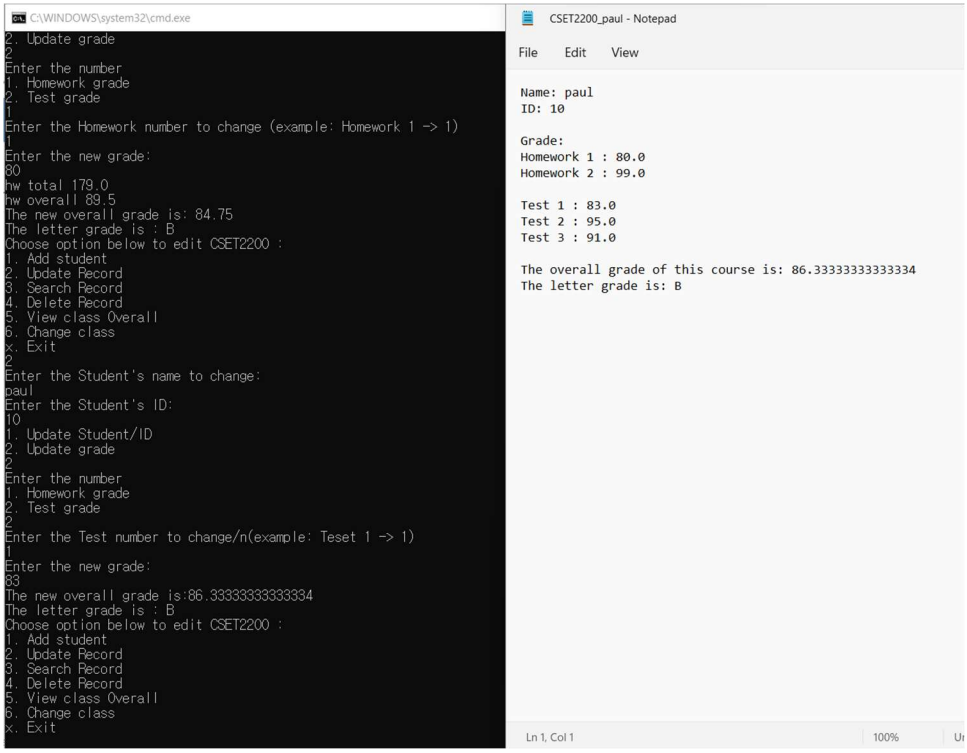
They are the screenshots of update name of cho student file.



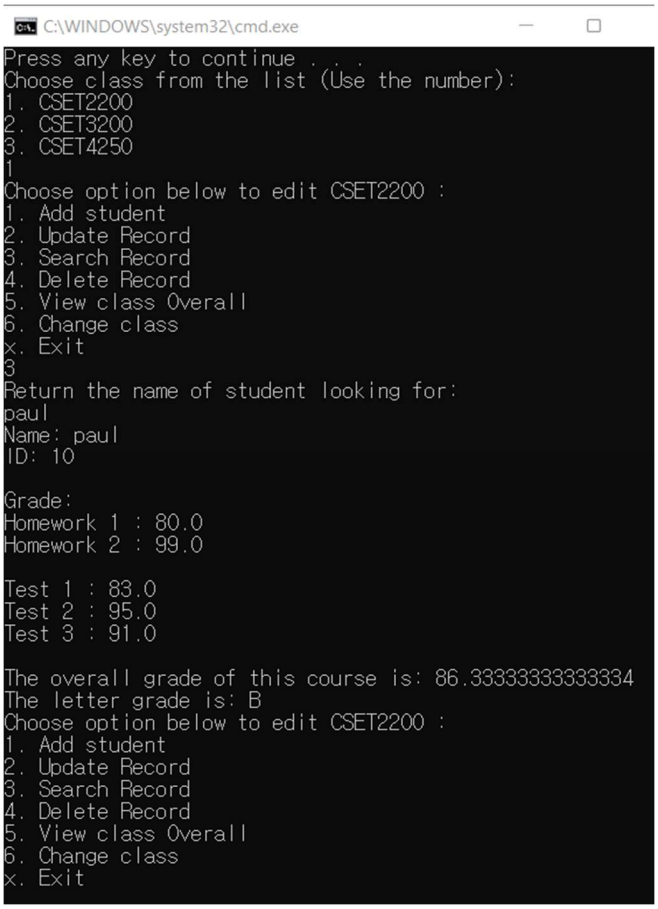
They are the screenshots of the change of paul's ID.



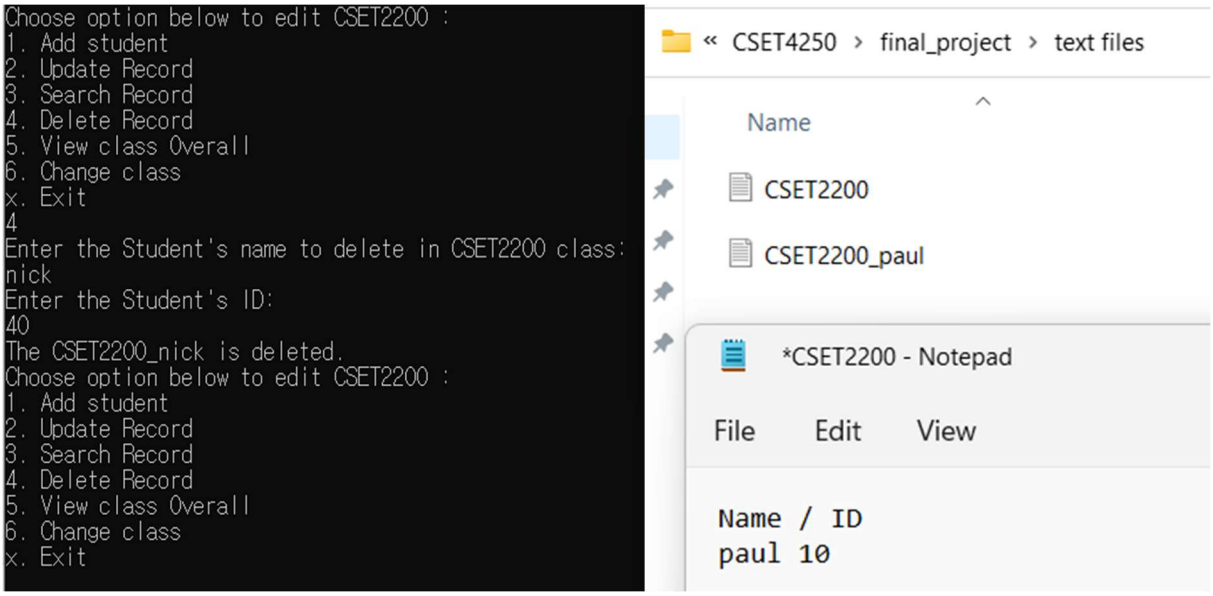
This is the screenshot of changing paul's first homework assignment grade to 80. By changing the grade, the overall grade and letter grade are changed accordingly. The overall grade is calculated by (all homework assignments grade added) / (number of homework assignments returned)



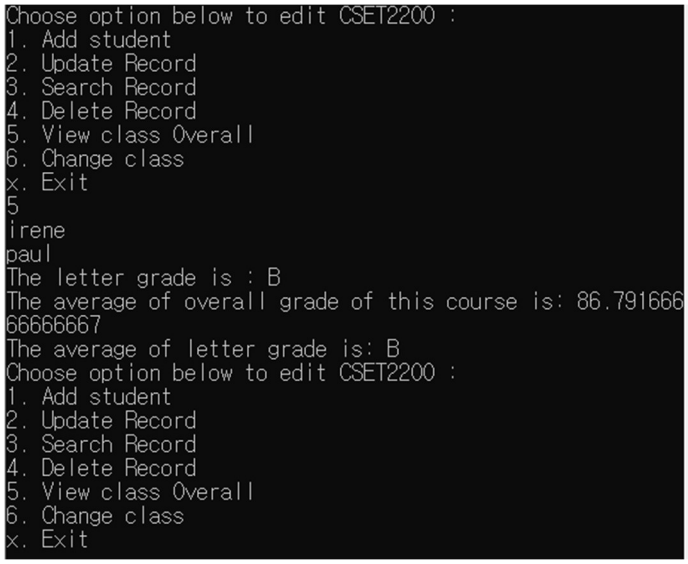
This is the screenshot of changing paul's first test grade to 83. By changing the grade, the overall grade and letter grade are changed accordingly.



This is the screenshot of searching paul's record



These screenshots are the deleted nick's record of student file and in course file.



This is the screenshot of get overall grade for the course with list of students in the course.

Question 2. Install the application

```
@echo off

cd C:\

if not exist "C:\CSET4250_FinalProject_HyunkunCho\" mkdir C:\CSET4250_FinalProject_HyunkunCho

cd D%USERPROFILE%\Downloads

move final_project C:\CSET4250_FinalProject_HyunkunCho

cd C:\CSET4250_FinalProject_HyunkunCho\final_project

javac grading_main.java

java grading_main

pause
```

The code above is to execute the Java program.

Question 3-b History and Overview of Java and Batch

Java

Java is an Object-Oriented Programming language and was developed by Sun Microsystems which was initiated by James Gosling and his team and released in 1995. Java is guaranteed to be "Write once, Run anywhere." Java was created on the principles like robust, portable, platform independent, high performance, multithread, simple, secure, architecture-neutral, interpreted, distributed, and dynamic. Currently Java is used in internet programming, mobile devices, games, e-business solutions, etc.

Batch Scripting

It is also known as batch programming. It consists of a series of commands to be executed by the command-line interpreter, stored in a plain text file. Its control and dominance in the Windows environment can never be neglected. Using the Batch script, almost every task and every action can be performed by a simple sequence of commands typed on the Windows Command Prompt.

Question 3-c Comparison

Java

Readability

For simplicity, its coding style is very clean and easy to understand

For orthogonality, Java is orthogonal. In example, public/static can go together without any problem.

For data types, Java has byte, short, int, long, float, double, Boolean, and char.

For syntax, it is mostly derived from C and C++. Unlike C++, in Java there are no global function or variables.

Writability

For Simplicity and orthogonality, Java has few constructs, small number of primitive and a small set of rules for combining them.

For abstraction, in Java, data abstraction is defined as the process of reducing the object to its essence so that only the necessary characteristics are exposed to the users.

Reliability

For exception handling, Java has both checked and unchecked.

For type checking, a Java compiler enforces a syntactic discipline on program text called static typing. The compiler uses a collection of type-checking rules to determine whether a program is well typed.

Aliasing, in Java, alias is used when reference is linked to the same object.

Cost

Cost of training, compiling and maintaining program should be nearly none. However, the cost of writing program depends on how good is the programmer.

C++

Readability

For simplicity, compared to Java, C++ is less simple because Java is created based on C and C++ and focused on making simpler

For orthogonality, C++ is not orthogonal because arithmetic operators do not consistently work on pointers.

For data types, there are 18 data types where Java has 8.

For syntax consideration, C++ is both a procedural and object-oriented programing language. So, C++ has features specific to procedural languages as well as as features of object-oriented programing language.

Writability

For simplicity and orthogonality, as C++ has more data types and has feature to procedural language, compared to Java, more difficult to write.

For support for abstraction, C++ supports abstraction using classes and header files.

For expressivity, Java is nearly identical expressive as C++

Reliability

For type checking, C++ compiler produces errors in some cases, it converts data to the correct type.

For exception handling, C++ use throw catch, try and try.

For aliasing, it is used same as in Java.

Cost

Cost of training, compiling and maintaining program should be nearly none. However, the cost of writing program depends on how good is the programmer.

C#

Readability

For simplicity, modernity feature and simplicity are the pillars of C#

For orthogonality, it is orthogonal

For data types, C# has int, long, float, double, bool, char, and string where Java has 8.

For syntax consideration, both languages are syntactically similar.

Writability

For simplicity and orthogonality, C# and Java are both simple and orthogonal.

For support for abstraction, in C#, it is achieved using abstract classes.

For expressivity, Java is nearly identical expressive as C#.

Reliability

For exception handling, C# only supports unchecked exceptions.

For type checking, C# use the typeof operator to check if the run-time type of the expression result exactly matches a given type.

Aliasing, C# supports aliasing on methods and classes.

Cost

Cost of training, compiling and maintaining program should be nearly none. However, the cost of writing program depends on how good is the programmer.

Python

Readability

For simplicity, on syntax simplicity, Python is simpler.

For orthogonality, Python is orthogonal language.

For data types, there are 14 data types in Python where 8 in Java.

For syntax consideration, it is similar to Java

Writability

For simplicity and orthogonality, Python is simpler than Java and orthogonal.

For support for abstraction, Python use abstraction class and abstract method.

For expressivity, Python is an expressive language.

Reliability

For type checking, Python is a dynamically typed language. PEP 484 introduced type hints which make it possible to also do static type checking of Python code.

For exception handling, Python has many built-in exceptions that enable the program to run without interruption and give the output.

For aliasing, Python supports aliasing.

Cost

Cost of training, compiling and maintaining program should be nearly none. However, the cost of writing program depends on how good is the programmer.

Question 4 Java explanation

i. Syntax

The syntax of Java is mostly derived from C and C++. Unlike in C++, Java does not have global functions or variables but there are data members which are also regarded as global variables. All code belongs to classes and all values are objects. Some features like operator overloading or unsigned integer types are excluded to simplify the language and to avoid possible programming mistakes. The Java syntax is gradually extended in the course of JDK releases.

ii. Control Structures

There are three kinds of control structures: conditional branches, loops, branching statement.

Conditional branches are used for choosing between two or more paths. In Java, if/else/else if, ternary operator and switch, are used.

Loops are used to iterate through multiple values/ objects and repeatedly fun specific code blocks. In Java, break and continue are used.

iii. Data Structures

The data structure refers to a data collection with well-defined operations and behavior or properties. A data structure is a unique way of storing or organizing the data in computer memory so that can be used effectively.

In linear data structure, all elements are arranged in the linear order. In Java, array, linked list, stack and queue are used.

In non-linear data structure, it does not arrange the data as in linear data structures. In Java, tree and graph are used.

iv. I/O

Java brings various streams with its I/O package that helps the user to perform all the input-output operations. They support all the types of objects, data types, characters, files etc. to fully execute the I/O operations. The 3 standard streams are System.in, System.out and System.err.

System.in is the standard input stream that is used to read input from the input device

System.out is the standard output stream that is used to produce the result of a program on an output device.

System.err is the standard error stream that is used to output all the error data that a program might throw.

v. Parameter Passing Methods

There are two types of parameters: formal parameter and actual parameter. Formal parameter is that a variable and its type as they appear in the prototype of the function or method. Actual parameter is that the variable or expression corresponding to a formal parameter that appears in the function or method call in the calling environment.

There are two types of parameter passing methods: pass by value and call by reference.

Pass by value: Changes made to formal parameter do not get transmitted back to the caller. Any modifications to the formal parameter variable inside the called function or method affect only the separate storage location and will not be reflected in the actual parameter in the calling environment.

Call by reference: Changes made to formal parameter do get transmitted back to the caller through parameter passing. Any changes to the formal parameter are reflected in the actual parameter in the calling environment as formal parameter receives a reference to the actual data

vi. Scope rules

In general, a set of curly brackets defines a scope. In Java, a variable can be used within the same set of brackets. Any variable defined in a class outside of any method can be caused by all methods. When a method has the same local variable name, ‘this’ keyword can be used to reference the current class variable.

vii. Stack/Heap – Constructors/Destructors

Stack memory is physical space allocated to each thread at run time. It stores items that have a very short life such as methods, variables, and reference variables of the objects. It follows the LIFO order and it is not flexible because we cannot alter the allocated memory. The stack memory has faster access, allocation and deallocation. It has smaller in memory size, the variables are visible only to the owner thread. The allocation and deallocation are done automatically by the compiler. The memory allocation is continuous.

Heap space stores objects and JRE classes. It is flexible because we can alter the allocated memory. It has slower access, allocation, and deallocation. It is large in size and visible to all threads. The allocation and deallocation are done manually by the programmer. The memory allocated in random order.

There are two types of constructors in Java: default constructor and parameterized constructor. The rules for creating Java constructor are constructor name must be same as its class name, a constructor must have no explicit return type, and the constructor cannot be abstract, static, final and synchronized.

There is no concept of destructor in Java. In place of the destructor, Java provides the garbage collector that works the same as the destructor. The garbage collector is a thread that runs on virtual machine. It automatically deletes the unused objects and free up the memory.

viii. Error handling procedures

When the code in try block causes an error, the exception that the code throws are caught by one or more catch blocks. The exception header will go through possible error already written in the header file and in catch block, it will execute the matched solution in the header file.