Problem 2 (100pt):

This homework aims at reviewing topics of I/O library, STL data structure map, and class hierarchies.

(25pt) Implement four classes: `Person, Employee, Student,` and `TA` with hierarchical structures introduced in class. All data fields should remain private and no friend classes and functions should be declared. Here is a quick recap:

- `Person`: has one data attribute `string name`;
- `Employee`: inherits from `Person` and has `string ID` and `double salary`;
- `Student`: inherits from `Person` and has `string ID`;
- `TA`: inherits from `Student` and `Employee` with one name and two different ID values

The file "Employees.txt" stores information of employees and the file "Students.txt" stores the information of students. Each line in "Employees.txt" has 41 characters in the following format, where the numbers indicate length of each data field:
`[name (20)][ID (10)][salary (10)][\n (1)]`

Each line in "Students.txt" has 31 characters in the following format
`[name (20)][ID (10)][\n (1)]`

You can assume that data won't exceed given data field length.

(20pt) Write a template function `read`:

- `read` reads from files or the console, and store information in maps
- `read` is templated by the type of data it reads, `T`, such as `Student` or `Employee`, and an integer `T_LINE_SIZE`, which stores the number of characters in one line
- Each pair in maps is a mapping from `name` to a pointer `T*`

(20pt) Write a function `combine` that combines two maps into one and merges the information of the same person. You don't need to account for the cases where two different people have the same name.

```
void combine(const std::map<std::string, Student*>& students,
             const std::map<std::string, Employee*>& employees,
             std::map<std::string, Person*>& combined);
```

(20pt) Write a template function `print` that prints elements in `std::less<string>` order to files or the console with the following format:

- Student: `[name (20)][ID (10)][salary (10)][\n (1)]`
- Employee: `[name (20)][ID (10)][\n (1)]`
- TA: `[name (20)][Student ID (10)][Employee ID (10)][salary (10)][endl (1)]`

A "main.cpp" file is given showing how we will use your code, together with "Employees.txt" and "Students.txt". Your output should be the same as the sample output given below. Your code should work for other test cases as well.

```
**********Students**********
Kryze, Satine           S01230
Tano, Ahsoka             S0301
Ventress, Asajj          S0418
**********Employees**********
Amidala, Padme          E0010a     12000
Kryze, Satine             E001     12000
Mothma, Mon              E0981     10000
Tano, Ahsoka            E0010b      1000
**********Combined**********
Amidala, Padme          E0010a     12000
Kryze, Satine           S01230      E001     12000
Mothma, Mon              E0981     10000
Tano, Ahsoka             S0301    E0010b      1000
Ventress, Asajj          S0418
```

Instructions:

- Your code will be graded based on correctness, efficiency, clearness, and practices. For this homework, the only library header files you are allowed to use are:
  - iostream, iomanip
  - fstream, sstream
  - map
  - string
- (5pt) Separate your code into `HW2.h` and `HW2.cpp` and submitted to CCLE. Add description of this file in the beginning to show your ownership. A sample description may look like:

```
/*
    PIC 10C Homework 1, Heap.h
    Purpose: Define a template heap class
    Author: John Doe
    Date: 01/01/2021
*/
```

- (10pt) Good coding practice includes commenting your code, using descriptive variable/function names, using efficient algorithms, etc. Coding practice part will be graded by three levels: 0, 5, 10.
- The official grading compiler is Visual Studio 2019 and you may lose majority of points if your code does not compile. If you don't have VS2019 installed in your computer, you are welcome to check your homework using virtual machines before submission. Please only check your homework after it has satisfying results on your local computer. Manually log out your account after using the machine.