

Turnin 作業 8

- Turnin Code: **cpp.hw8**
- Due Date: 5/18 Monday 23:59:00 (midnight) **Hard Deadline**

繳交方式說明

本次作業繳交將以資料夾的形式繳交，需要為每一題建立一個資料夾（資料夾名稱為該題題目前方之代號，第一題為p1第二題為p2餘以此類推）。

繳交說明可參考【Turnin 作業 4】中 p6 到 p10

任何未依照正確繳交格式的檔案將以 0 分計。



本文使用「」及「`\n`」代表「空白字元」與「Enter 換行字元」，並且將使用者輸入的部份使用灰階方式顯示。另外，題目的執行結果中，如果出現「(」、「)」、「:」、「;」、「.」與「,」等符號，皆為英文半形！

p1 學生類別實作（封裝）

封裝是為了隱藏物件的內部實作細節，透過一些介面存取物件內的資料並保護資料不被外部隨意修改，可提升程式碼的安全性與可維護性。本題的目的是計算所有學生的學期成績，請參考下列的 main.cpp 程式（請依據檔名旁的路徑至 ws 取得程式碼）：

```
#include "student.h"
#define MAX 10

int main()
{
    double class_average = 0;
    Student **student = new Student *[MAX];
    string names[MAX] = {"Daphne Lloyd", "Aaron Gold", "Julia Ruth", "Mick
Felix", "Adonis Attlee",
                        "Renata Grote", "Abner Piers", "Kama Hood",
"Kennedy George", "Ian Blake"};
```

```
for (int i = 0; i < MAX; i++)
{
    student[i] = new Student;
    student[i]->set_name(names[i]);
    student[i]->set_stu_id("cbb11341" + to_string(i));
}

student[0]->set_score(87.42, 73.56, 95.30, 68.18);
student[1]->set_score(62.15, 78.94, 94.01, 73.67);
student[2]->set_score(15.33, 65.76, 82.89, 74.24);
student[3]->set_score(68.02, 84.19, 82.47, 65.85);
student[4]->set_score(99.11, 65.62, 84.78, 78.49);
student[5]->set_score(84.54, 86.30, 93.92, 85.06);
student[6]->set_score(67.28, 81.45, 65.17, 86.31);
student[7]->set_score(79.66, 83.22, 91.50, 97.03);
student[8]->set_score(83.79, 76.81, 53.04, 61.46);
student[9]->set_score(90.23, 70.88, 65.55, 74.72);

cout << "Student ID\tName\t\tgeneral
performance\texam1\t\texam2\t\tfinal exam\t\tterm score" << endl;
for (int i = 0; i < MAX; i++)
{
    student[i]->calculate_term_score();
    cout << student[i]->get_stu_id() << "\t"
        << student[i]->get_name() << "\t\t"
        << student[i]->get_general_performance() << "\t\t"
        << student[i]->get_exam1() << "\t\t"
        << student[i]->get_exam2() << "\t\t"
        << student[i]->get_final_exam() << "\t\t"
        << student[i]->get_term_score() << endl;
}

for (int i = 0; i < MAX; i++)
{
    delete student[i];
}
delete[] student;
student = nullptr;
return 0;
}
```

請參考 18~27 行 `set_score` 函式，其引數從左至右分別為「general performance」平時成績、「exam1」第一次期中考、「exam2」第二次期中考，與「final exam」期末考，這四項成績分別佔學期成績的 25%，計算學期成績時請四捨五入到小數點後第一位。

請完成名為 **student.h** 與 **student.cpp** 的 C++ 程式，它們分別是 Student 類別的宣告定義與實作。請注意 Student 類別中的所有成員變數請放置於 `private` 區塊，所有成員函式請放置於 `public` 區塊，否則不予計分。

本題的相關程式將使用以下的 Makefile 進行編譯：

```
all: main.cpp student.o
    c++ main.cpp student.o
student.o: student.cpp student.h
    c++ student.cpp -c
clean:
    rm -f *.o *~ *.~* a.out*
```

此題的執行結果可參考如下：

```
[3:23user@wsap1] ./a.out
StudentIDNamegeneralperformanceexam1exam2final
examterm
score
cbb113410DaphneLloyd87.4273.5695.368.1881.1
cbb113411AaronGold62.1578.9494.0173.6777.2
cbb113412JuliaRuth15.3365.7682.8974.2459.6
cbb113413MickFelix68.0284.1982.4765.8575.1
cbb113414AdonisAttlee99.1165.6284.7878.4982
cbb113415RenataGrote84.5486.393.9285.0687.5
cbb113416AbnerPiers67.2881.4565.1786.3175.1
cbb113417KamaHood79.6683.2291.597.0387.9
cbb113418KennedyGeorge83.7976.8153.0461.4668.8
cbb113419IanBlake90.2370.8865.5574.7275.3
[3:23user@wsap1]
```

為便利同學起見，以上的執行結果以固定寬度字型再次顯示如下：



```
[3:23user@wsap1] ./a.out
StudentIDNamegeneralperformanceexam1exam2final
examterm
score
cbb113410DaphneLloyd87.4273.5695.368.1881.1
cbb113411AaronGold62.1578.9494.0173.6777.2
cbb113412JuliaRuth15.3365.7682.8974.2459.6
```



```

▲▲▲▲▲82.89▲▲▲▲▲74.24▲▲▲▲▲59.6↵
cbb113413▲▲▲▲▲Mick▲Felix▲▲▲▲▲68.02▲▲▲▲▲84.19▲▲▲▲▲
▲▲▲▲▲82.47▲▲▲▲▲65.85▲▲▲▲▲75.1↵
cbb113414▲▲▲▲▲Adonis▲Attlee▲▲▲▲▲99.11▲▲▲▲▲65.62▲▲▲▲▲
▲▲▲▲▲84.78▲▲▲▲▲78.49▲▲▲▲▲82↵
cbb113415▲▲▲▲▲Renata▲Grote▲▲▲▲▲84.54▲▲▲▲▲86.3▲▲▲▲▲
▲▲▲▲▲93.92▲▲▲▲▲85.06▲▲▲▲▲87.5↵
cbb113416▲▲▲▲▲Abner▲Piers▲▲▲▲▲67.28▲▲▲▲▲81.45▲▲▲▲▲
▲▲▲▲▲65.17▲▲▲▲▲86.31▲▲▲▲▲75.1↵
cbb113417▲▲▲▲▲Kama▲Hood▲▲▲▲▲79.66▲▲▲▲▲83.22▲▲▲▲▲
▲▲▲▲▲91.5▲▲▲▲▲97.03▲▲▲▲▲87.9↵
cbb113418▲▲▲▲▲Kennedy▲George▲▲▲▲▲83.79▲▲▲▲▲76.81▲▲▲▲▲
▲▲▲▲▲53.04▲▲▲▲▲61.46▲▲▲▲▲68.8↵
cbb113419▲▲▲▲▲Ian▲Blake▲▲▲▲▲90.23▲▲▲▲▲70.88▲▲▲▲▲
▲▲▲▲▲65.55▲▲▲▲▲74.72▲▲▲▲▲75.3↵
[3:23▲user@ws▲p1]▲

```



- 本題相關的程式碼路徑已註明於檔名右側，同學們可以透過路徑複製到自己的家目錄。
- **Student 類別中的所有成員變數請放置於 `private` 區塊，所有成員函式請放置於 `public` 區塊，否則不予計分**
- 本題若有使用浮點數的需求，請使用 `double` 型態。
- 本題應繳交檔案如下（至於 `main.cpp` 與 `Makefile` 則不需繳交）：
 - `student.h`
 - `student.cpp`

p2 旅客類別實作（封裝）

延續 `cpp.hw7` 的 `p3` 本題仍是幫助鳳梨航空寄出關於航班起飛前相關資訊的 email 給旅客，但本題增加了 `show_email_content()` 函式供 `main()` function 呼叫使用，請參考下列的 `main.cpp` 程式（請依據檔名旁的路徑至 `ws` 取得程式碼）：

```

#include "tourist.h"
using namespace std;

void show_email_content(Tourist tourist)
{
    cout << "Dear " << tourist.get_first_name() << " " <<
tourist.get_last_name() << ", " << endl;
    cout << "Thank you for choosing Pineapple Airlines. We are excited to
welcome you on board for your upcoming flight to "
        << tourist.flight.get_destination() << ". Please find your flight
details below to ensure a smooth journey." << endl

```

```

        << endl;

    cout << "Flight Information: " << endl;
    cout << "\tFlight Number: " << tourist.flight.get_flight_no() << endl;
    cout << "\tFrom: " << tourist.flight.get_departure() << endl;
    cout << "\tTo: " << tourist.flight.get_destination() << endl;
    cout << "\tLuggage Limit: " << tourist.get_luggage_limitation() << endl;
    cout << "\tCabin Class: " << tourist.get_cabin_class() << endl;
    cout << "\tDate: " << tourist.flight.get_date() << endl;
    cout << "\tBoarding Time: " << tourist.flight.get_boarding_time() <<
endl;
    cout << "\tGate: " << tourist.flight.get_gate() << endl;
    cout << "Safe travels,\nThe Pineapple Airlines Team" << endl;
}

int main()
{
    Tourist Alex, Jamie, Dennis;
    cout << "-----" << endl;
    cout << "-----" << endl;
    //           first name, last name, cabin class
    Alex.set_info("Alex", "Brookes", "Economy");
    //           flight no.           from           to
    Alex.flight.set_info("PI 564", "Hong Kong(HKG)", "Taiwan Taoyuan(TPE)",
"9/27/2021", "18:45", "527");
    show_email_content(Alex);

    cout << "-----" << endl;
    cout << "-----" << endl;
    Jamie.set_info("Jamie", "Davis", "Business");
    Jamie.flight.set_info("PI 612", "Osaka (KIX)", "Seoul(ICN)",
"3/26/2026", "06:30", "7");
    show_email_content(Jamie);

    cout << "-----" << endl;
    cout << "-----" << endl;
    Dennis.set_info("Dennis", "Wilson", "First");
    Dennis.flight.set_info("PI 950", "Kaohsiung (KHH)", "Hong Kong(HKG)",
"1/30/2026", "10:00", "092");
    show_email_content(Dennis);

    return 0;
}

```

請特別注意，鳳梨航空公司與其他的航空公司一樣有「economy class 經濟艙」、「business class 商務艙」以及「first class 頭等艙」三個艙等。其中經濟艙的行李限制以 23 kg 為上限，其餘兩個艙等則以 32 kg 為上限。

請完成名為 **tourist.h** 與 **tourist.cpp** 的 C++ 程式，它們分別是 Tourist 與 Flight 類別的 **宣告定義與實作**。請注意 Tourist 中的以 Flight 類別所宣告的物件 flight 需放置在 public 區塊以外（除 flight 物件外）與 Flight 類別所有成員變數請放置於 private 區塊，所有成員函式請放置於 public 區塊，否則不予計分。

本題的相關程式將使用以下的 Makefile 進行編譯：

```
all: main.cpp tourist.o
    c++ main.cpp tourist.o
tourist.o: tourist.cpp tourist.h
    c++ tourist.cpp -c
clean:
    rm -f *.o *~ *.~* a.out*
```

此題的執行結果可參考如下：

```
[3:23user@wsap2] ./a.out
```

```
-----
Dear Alex Brookes,
```

```
Thank you for choosing Pineapple Airlines. We are excited to welcome you on board for your upcoming flight to Taiwan Taoyuan (TPE). Please find your flight details below to ensure a smooth journey.
```

```
Flight Information:
```

```
*****Flight Number: PI564
```

```
*****From: Hong Kong (HKG)
```

```
*****To: Taiwan Taoyuan (TPE)
```

```
*****Luggage Limit: 23
```

```
*****Cabin Class: Economy
```

```
*****Date: 9/27/2021
```

```
*****Boarding Time: 18:45
```

```
*****Gate: 527
```

```
Safe travels,
```

```
The Pineapple Airlines Team
```

```
-----
```

```
Dear Jamie Davis,
```

```
Thank you for choosing Pineapple Airlines. We are excited to welcome you on board for your upcoming flight to Seoul (ICN). Please find your flight details below to ensure a smooth journey.
```

```
Flight Information:
```

```
*****Flight Number: PI612
```

```
*****From: Osaka (KIX)
```

```
*****To: Seoul (ICN)
```

```
*****Luggage Limit: 32
```

```
*****Cabin Class: Business
```

```
*****Date: 3/26/2026
```

```

#####BoardingTime:06:30
#####Gate:7
Safe travels,
The Pineapple Airlines Team
-----
Dear Dennis Wilson,
Thank you for choosing Pineapple Airlines. We are excited to welcome you on board for your
upcoming flight to Hong Kong (HKG). Please find your flight details below to ensure a smooth
journey.
Flight Information:
#####Flight Number: PI950
#####From: Kaohsiung (KHH)
#####To: Hong Kong (HKG)
#####Luggage Limit: 32
#####Cabin Class: First
#####Date: 1/30/2026
#####Boarding Time: 10:00
#####Gate: 092
Safe travels,
The Pineapple Airlines Team
[3:23user@wsap2]

```



- 本題相關的程式碼路徑已註明於檔名右側，同學們可以透過路徑複製到自己的家目錄。
- 請注意 `Tourist` 中的以 `Flight` 類別所宣告的物件 `flight` 需放置在 `public` 區塊以外 `Tourist` (除 `flight` 物件外) 與 `Flight` 類別所有成員變數請放置於 `private` 區塊，所有成員函式請放置於 `public` 區塊，否則不予計分。
- 本題若有使用浮點數的需求，請使用 `double` 型態。
- 本題應繳交檔案如下（至於 `main.cpp` 與 `Makefile` 則不需繳交）：
 - `tourist.h`
 - `tourist.cpp`

p3 銀行帳戶類別實作（封裝）

接續 `cpp.hw7` 的 `p1` 本題要對 `BankAccount` 類別進行封裝處理。

請參考下列的 `main.cpp` 程式（請依據檔名旁的路徑至 `ws` 取得程式碼）：

```

#include "bank.h"
#define SUCCESS "\e[0;32m[ SUCCESS ]\e[0m " // show "[ SUCCESS ] " with
green color
#define FAIL "\e[0;31m[ FAIL ]\e[0m " // show "[ FAIL ] " with

```

red color

```
class Banking
{
public:
    void show_status(BankAccount a)
    {
        cout << a.get_name() << "\'s current balance: " << a.get_balance()
<< endl;
    }

    void save(BankAccount &a, int money)
    {
        string output;
        if (a.save(money))
        {
            output = SUCCESS + a.get_name() + " saved $" + to_string(money);
        }
        else
        {
            output = FAIL + a.get_name() + " failed to save $" +
to_string(money);
        }
        cout << output << endl;
        a.write_transaction_record(to_string(a.get_transaction_record_count()) + " "
+ output + "\n");
    }

    void transfer(BankAccount &a, BankAccount &b, int money)
    {
        string output;
        if (a.transfer(money, b))
        {
            output = SUCCESS + a.get_name() + " transfered $" +
to_string(money) + " to " + b.get_name();
        }
        else
        {
            output = FAIL + a.get_name() + " failed to transfer $" +
to_string(money) + " to " + b.get_name();
        }
        cout << output << endl;
        a.write_transaction_record(to_string(a.get_transaction_record_count()) + " "
+ output + "\n");
    }

    void withdraw(BankAccount &a, int money)
    {
        string output;
        if (a.withdraw(money))
        {
```

```
        output = SUCCESS + a.get_name() + " withdrew $" +
to_string(money);
    }
    else
    {
        output = FAIL + a.get_name() + " failed to withdraw $" +
to_string(money);
    }
    cout << output << endl;
a.write_transaction_record(to_string(a.get_transaction_record_count()) + " "
+ output + "\n");
    }
};

int main()
{
    Banking bank;
    BankAccount Justin("Justin");
    BankAccount Amy("Amy");

    cout << "[1] -----" << endl;
    bank.show_status(Justin);
    bank.show_status(Amy);

    cout << "[2] -----" << endl;
    bank.save(Amy, 4090);
    bank.save(Amy, 0);
    bank.save(Amy, -216);

    cout << "[3] -----" << endl;
    bank.transfer(Amy, Justin, 1080);
    bank.transfer(Amy, Justin, 4050);
    bank.transfer(Amy, Justin, 0);

    cout << "[4] -----" << endl;
    bank.withdraw(Amy, 12000);
    bank.withdraw(Amy, 3000);
    bank.withdraw(Amy, 0);

    cout << "[5] -----" << endl;
    bank.show_status(Amy);
    bank.show_status(Justin);

    cout << "[6] -----" << endl;
    Amy.show_transaction_record();

    return 0;
}
```

請完成名為 **bank.h** 與 **bank.cpp** 的 C++ 語言程式，它們分別是 BankAccount 類別的 宣告定義 與 實作。請注意 BankAccount 類別中的所有成員變數請放置於 `private` 區塊，所有成員函式請放置於 `public` 區塊，否則不予計分。

本題將使用以下的 Makefile 進行編譯：

```
all: main.cpp bank.o bank.h
    c++ main.cpp bank.o
bank.o: bank.cpp bank.h
    c++ bank.cpp -c
clean:
    rm -f *.o *~ *.*~ a.out*
```

此題的執行結果可參考如下：

```
[3:23user@wsap3]▲./a.out↵
[1]▲-----↵
Justin's▲current▲balance:▲0↵
Amy's▲current▲balance:▲0↵
[2]▲-----↵
[▲SUCCESS▲]▲Amy▲saved▲$4090↵
[▲▲▲FAIL▲▲]▲Amy▲failed▲to▲save▲$0↵
[▲▲▲FAIL▲▲]▲Amy▲failed▲to▲save▲$-216↵
[3]▲-----↵
[▲SUCCESS▲]▲Amy▲transferred▲$1080▲to▲Justin↵
[▲▲▲FAIL▲▲]▲Amy▲failed▲to▲transfer▲$4050▲to▲Justin↵
[▲▲▲FAIL▲▲]▲Amy▲failed▲to▲transfer▲$0▲to▲Justin↵
[4]▲-----↵
[▲▲▲FAIL▲▲]▲Amy▲failed▲to▲withdraw▲$12000↵
[▲SUCCESS▲]▲Amy▲withdrew▲$3000↵
[▲▲▲FAIL▲▲]▲Amy▲failed▲to▲withdraw▲$0↵
[5]▲-----↵
Amy's▲current▲balance:▲10↵
Justin's▲current▲balance:▲1080↵
[6]▲-----↵
Amy's▲transaction▲record:▲↵
1▲[▲SUCCESS▲]▲Amy▲saved▲$4090↵
2▲[▲▲▲FAIL▲▲]▲Amy▲failed▲to▲save▲$0↵
3▲[▲▲▲FAIL▲▲]▲Amy▲failed▲to▲save▲$-216↵
4▲[▲SUCCESS▲]▲Amy▲transferred▲$1080▲to▲Justin↵
5▲[▲▲▲FAIL▲▲]▲Amy▲failed▲to▲transfer▲$4050▲to▲Justin↵
6▲[▲▲▲FAIL▲▲]▲Amy▲failed▲to▲transfer▲$0▲to▲Justin↵
7▲[▲▲▲FAIL▲▲]▲Amy▲failed▲to▲withdraw▲$12000↵
8▲[▲SUCCESS▲]▲Amy▲withdrew▲$3000↵
9▲[▲▲▲FAIL▲▲]▲Amy▲failed▲to▲withdraw▲$0↵
[3:23user@wsap3]▲
```



- 本題相關的程式碼路徑已註明於檔名右側，同學們可以透過路徑複製到自己的家目錄。
- **BankAccount** 類別中的所有成員變數請放置於 `private` 區塊，所有成員函式請放置於 `public` 區塊，否則不予計分
- 本題應繳交檔案如下（至於 `main.cpp` 與 `Makefile` 則不需繳交）：
 - `bank.h`
 - `bank.cpp`

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