

Homework 1

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日期 9/24/2022

Task 1：三角形

[Source Code](#)以及 [Replit網址](#)

- 手動輸入三邊長之終端機輸出

```
1 #include <chrono> //time.now()
2 #include <cmath> //pow(), sqrt()
3 #include <cstdlib> //rand() srand()
4 #include <iostream> //system("pause")
5 #include <stdio.h> //printf()
6 #include <vector>
7
8 class Inputs;
9 bool getInput(int &out_sideA, int &out_sideB, int &out_sideC, bool autoRandom);
10 bool checkInput(const int &sideA, const int &sideB, const int &sideC);
11 float getArea(const int &sideA, const int &sideB, const int &sideC);
12
13 class Inputs {
14 public:
15     int inputIdx, sideA, sideB, sideC;
16     float area;
17     Inputs(int _inputIdx, int _sideA, int _sideB, int _sideC, float _area)
18         : inputIdx(_inputIdx), sideA(_sideA), sideB(_sideB), sideC(_sideC),
19           area(_area) {}
20
21     Inputs() = delete;
22 };
23
```

```
Student B10831020
Please choose whether to use automatically generated numbers as input?(1:Yes, 0:No) 0
Please input three values as the length of three sides
78 98 58
The area of this triangle is 43719
Please input three values as the length of three sides
65 45 74
The area of this triangle is 22842
Please input three values as the length of three sides
12 35 41
The area of this triangle is 864
Please input three values as the length of three sides
621 537 455
The area of this triangle is 1.75723e+07
Please input three values as the length of three sides
8 7 5
The area of this triangle is 30
Please input three values as the length of three sides
0 0 0
At least one side is smaller or equal to 0, terminating program.
The largest triangle's area is 30.00 with sides (8, 7, 5)
The smallest triangle's area is 17572276.00 with sides (621, 537, 455)
Printing all inputs in this session
=====
Input #4: sides(8, 7, 5) with area 30.00
Input #2: sides(12, 35, 41) with area 864.00
Input #1: sides(65, 45, 74) with area 22842.00
Input #0: sides(78, 98, 58) with area 43719.00
Input #3: sides(621, 537, 455) with area 17572276.00
sh: 1: pause: not found
```

- 自動判斷三邊長是否合適。若三邊長其中一者為0、負數或三者長度無法組成三角形，程式終止
- 當三邊長可組成三角形，計算並顯示其面積
- 可以接收無限多筆輸入
- 使用while loop
- 自定義函式採void pass by reference及pass by value多種形式。若函式不須修改變數值，採void pass by const reference提升效能，避免複製變數值占用記憶體空間

```
bool getInput(int& out_sideA, int& out_sideB, int& out_sideC, bool
autoRandom);
bool checkInput(const int& sideA, const int& sideB, const int& sideC);
float getArea(const int& sideA, const int& sideB, const int& sideC);
```

Task 2：使用vector儲存數據

- 自動產生亂數作為三邊長
- 自定義class Inputs儲存單筆輸入之三邊長與其三角形面積，並以vector<Inputs*>儲存各比輸入

```
class Inputs
{
public:
    int inputIdx, sideA, sideB, sideC;
    float area;
```

```
Inputs(int _inputIdx, int _sideA, int _sideB, int _sideC, float _area):
    inputIdx(_inputIdx),
    sideA(_sideA),
    sideB(_sideB),
    sideC(_sideC),
    area(_area)
{}

Inputs() = delete;
};
```

- 使用for loop與auto印出所有資料

```
for(auto ptr : inputLog){ //print all inputs in this session
    printf("\tInput #d: sides(%d, %d, %d) with area %.2f\n", ptr->inputIdx, ptr->sideA, ptr->sideB, ptr->sideC, ptr->area);
}
```

- 利用srand()與rand()函式自動產生亂數作為三邊長輸入

```
std::cout << "Generating side lengths from random numbers" << std::endl;
std::cout << '\t';
auto currentTimeStamp =
std::chrono::steady_clock::now().time_since_epoch().count();
srand((uint64_t)currentTimeStamp);
out_sideA = abs(rand() % 10);
out_sideB = abs(rand() % 10);
out_sideC = abs(rand() % 10);
printf("The sides are (%d, %d, %d)", out_sideA, out_sideB, out_sideC);
```

心得

這份作業試圖使用pointer以及pass by reference等技巧，將vector inputLog傳進自定義的函式，然而過程相當不順利。查看網路上許多相關教學，似乎這樣做不應該出任何問題，親自嘗試時debugger卻產生看不懂的錯誤訊息。無論是pass by reference或pass by value，都產生compile time error。由於需準時繳交作業，只好暫時放棄把vector傳進函式。希望之後能夠釐清自己的錯誤，學會使用相關技巧提升程式效能。

很高興終於理解C++中*以及&的意義，看到別人的程式碼時將不再會毫無頭緒不知所措。過去在寫python script缺乏pointer觀念，利用pointer程式很容易產生segfault以及各種莫名奇妙的bug。經過訓練，希望可以更熟練。