



Tsuen Wan Government Secondary School
Olympiad in Informatics Team
荃灣官立中學 電腦奧林匹克校隊



2025/26
TEAM QUALIFICATION TEST
校隊資格試

PAPER 2 卷二

Time Allowed 限時 40 minutes 分鐘

Section 部分	Format 類型	# Questions 題目數	Total Marks 佔分
A 甲	Multiple Choice 多項選擇題	5	5
B 乙	Short Questions 短答題	6 A - F	9
C 丙	Long Questions 長填充題	2 G - J	6
Total 總分			20

- Assume that the size of the `int` data type is 32 bits.
假設 `int` 資料類型的長度為 32 位元。
- The following code is added to the beginning of all C++ programs.
在所有 C++ 程序的頂部加入以下程式碼：

C++

```
#include <algorithm>
#include <array>
#include <cmath>
#include <cstdlib>
#include <deque>
#include <forward_list>
#include <iostream>
#include <list>
#include <queue>
#include <stack>
#include <string>
#include <utility>
#include <vector>
using namespace std;
```

Section A 甲部 Multiple Choice 多項選擇題

# Questions 題目數	Total Marks 佔分
5	5

- For each question, choose the most appropriate answer and mark the corresponding box (**A**, **B**, **C**, or **D**) on the answer sheet.
請為下列每題各選一個最適合的答案，然後把答題紙對應的空格（**A**、**B**、**C**、或 **D**）填滿。
- One mark for each correct answer. No marks will be deducted for wrong answers.
答對得一分，答錯不扣分。

- 1 What is the output of the following program?
以下程序的輸出是什麼？

C++

```
int main() {  
    int x = 7;  
    if (x > 4)  
        x /= 2;  
    if (x > 3)  
        x -= 2;  
    cout << x;  
}
```

- A 1
B 1.5
C 2
D 3

- 2 What is the output of the following program?
以下程序的輸出是什麼？

C++

```
queue<int> Q;
stack<int> S;
int main() {
    int num[5] = {2, 1, 0, 2, 1};
    for (int i = 0; i < 5; ++i) {
        Q.push(num[i]);
        S.push(num[i]);
    }
    for (int i = 0; i < 5; ++i) {
        if (Q.front() >= S.top()) {
            cout << Q.front() << ' ';
            Q.pop();
        } else {
            cout << S.top() << ' ';
            S.pop();
        }
    }
}
```

- A 1 2 1 2 0
B 2 1 1 2 0
C 2 1 2 1 0
D 2 2 1 1 0

- 3 What is the output of the following program?
以下程序的輸出是什麼？

C++

```
int x = 3, y = 2;
void Swap() {
    x = y;
    y = x;
}
int main() {
    Swap();
    Swap();
    cout << x << ' ' << y;
}
```

- A 2 2
B 2 3
C 3 2
D 3 3

4 What is the output of the following program?

以下程序的輸出是什麼？

C++

```
int main() {  
    int x = 12;  
    for (int i = 0; i < 3; ++i)  
        ++x;  
    x /= 2;  
    cout << x;  
}
```

- A 2
- B 2.375
- C 7
- D 7.5

5 What is the output of the following program?

以下程序的輸出是什麼？

C++

```
int main() {  
    string arr[] = {"a", "ad", "aca", "ab"};  
    sort(arr, arr + 4);  
    cout << arr[3];  
}
```

- A a
- B ad
- C aca
- D ab

Section B 乙部 Short Questions 短答題

# Questions 題目數	Total Marks 佔分
6 A - F	9

- The blanks are labeled from A to F. Please fill in the blanks on the answer sheet.
下列各空格分別命名為 A 至 F，請在答題紙上對應的地方填上答案。
- Answers must be in C++.
必須使用 C++ 作答。
- You can write only one character in each box on the answer sheet.
答題紙上每個小格只可填上一個字符。
- Answers must not exceed the designated number of boxes.
答案長度不得多於該題提供的小格數目。

- 1 Caesar Cipher is an encryption method which requires shifting the character forward or backward. For example, after shifting TWGSS forward by 1 unit, we will get UXHTT. Note that after shifting Z forward by 1 unit, we will get A. For example, after shifting DAILY forward by 3 units, we will get GDLOB. 凱撒加密 (Caesar Cipher) 是一種需要將字元向前或向後移位的加密方法。例如將 TWGSS 向前移位 1 個單位後，我們將得到 UXHTT。值得注意的是，將 Z 向前移位 1 個單位後，我們將得到 A。例如將 DAILY 向前移位 3 個單位後，我們將得到 GDLOB。

Given that s is a string which consists only of capital letters and f is the forward shift unit where $0 \leq f < 26$, complete the function `Encryption()` so that it returns the correct encrypted text.

已知 s 為一個僅由大寫字母組成的字串，而 f 為向前移位的單位，其中 $0 \leq f < 26$ 。請完成函數 `Encryption()`，使其能傳回正確的加密文字。

C++

```
string Encryption(int f, string s) {
    for (int i = 0; i < s.size(); ++i) {
        s[i] += f;
        if (s[i] > 'Z')
            _____;
    }
    return s;
}
```

Answer 答案 A 1.5 marks 分

- 2 What is the output of the following program?
以下程序的輸出是什麼？

C++

```
int main() {  
    string s = "bcab";  
    char c = 'a';  
    int sum = 0;  
    for (int i = 0; i < s.size(); ++i) {  
        sum += s[i] - c;  
        c = s[i];  
    }  
    cout << sum;  
}
```

Answer 答案 B 1.5 marks 分

- 3 What is the output of the following program?
以下程序的輸出是什麼？

C++

```
int main() {  
    string a = "long long", b = "long", c = "int", d = "short";  
    int ans = 0;  
    if (a >= b)  
        ans += 1;  
    if (a >= c)  
        ans += 2;  
    if (a >= d)  
        ans += 4;  
    cout << ans;  
}
```

Answer 答案 C 1.5 marks 分

- 4 Given that $1 \leq a, b \leq 5$, how many pair(s) (a, b) are there such that the following function returns 0?
給定 $1 \leq a, b \leq 5$ ，有多少對 (a, b) 會使下列函數回傳 0？

C++

```
int func(int a, int b) {  
    return a % b;  
}
```

Answer 答案 D 1.5 marks 分

- 5 Complete the following program such that it outputs 3469.
完成以下程序使其輸出 3469。

C++

```
int main() {  
    int x = 3;  
    for (int i = 0; i < 4; ++i) {  
        cout << x;  
        x += _____ E _____;  
    }  
}
```

Answer 答案 _____ E _____ 1.5 marks 分

- 6 What is the output of the following program?
以下程序的輸出是什麼？

C++

```
int main() {  
    int cnt = 0;  
    for (int i = 1; i <= 10000; ++i) {  
        int fac = 0;  
        for (int j = 1; j <= i; ++j)  
            if (i % j == 0)  
                ++fac;  
        if (fac & 1)  
            ++cnt;  
    }  
    cout << cnt;  
}
```

Answer 答案 _____ F _____ 1.5 marks 分

Section C 丙部 Long Questions 長填充題

# Questions 題目數	Total Marks 佔分
2 G - J	6

- The blanks are labeled from G to J. Please fill in the blanks on the answer sheet.
下列各空格分別命名為 G 至 J，請在答題紙上對應的地方填上答案。
- Answers must be in C++.
必須使用 C++ 作答。
- You can write only one character in each box on the answer sheet.
答題紙上每個小格只可填上一個字符。
- Answers must not exceed the designated number of boxes.
答案長度不得多於該題提供的小格數目。

- 1 A “simple condition” consists of two positive integers separated by a comparison operator (=, < or >). It evaluates to either true or false. For example, the simple conditions $1 < 3$ and $68 = 68$ are true, while $2 = 5$ and $2 > 3$ are false.

一個「簡單條件」由兩個正整數以及一個分隔兩者的比較運算子（=、< 或 >）所組成。其運算結果為真或假。例如，簡單條件 $1 < 3$ 和 $68 = 68$ 的結果為真，而 $2 = 5$ 和 $2 > 3$ 的結果則為假。

How many possible integer values of x will make the conditions $x < 7$, $x > 2$ and $x > 0$ all true at the same time?

請問共有多少個可能的整數 x 值，能讓 $x < 7$ 、 $x > 2$ 和 $x > 0$ 這些條件同時成立（皆為真）？

Answer 答案 G 1 mark 分

Now, consider a simple condition where both of the numbers have the same number of digits. The number on the left side and the number on the right side of the comparison operator are stored in string l and string r respectively. Its comparison operator is stored in a character s . The function $f()$ determines whether the condition is true. Complete the following program so that it returns the correct result.

現在，考慮一個兩個數字的位數（長度）相同的簡單條件。比較運算符左側的數字與右側的數字分別儲存於字串 l 和字串 r 中，而其比較運算符則儲存於字元 s 中。函數 $f()$ 將判斷該簡單條件是否為真。請完成下列程式，使其能傳回正確的結果。

C++

```
bool f(string l, string r, char s) {
    for (int i = 0; i < l.size(); ++i)
        if (l[i] > r[i])
            return         H1        ;
        else if (l[i] < r[i])
            return         H2        ;
    return         H3        ;
}
```

Answer 答案 H1 H2 H3 2.5 marks 分

- 2 The score of a student in a subject is the product of the weight of that subject and the student's raw mark in that subject. The total score of a student is calculated by adding up the score from each subject.
 學生在某個科目的得分是該科目的權重與學生在該科目的原始分數的乘積。學生的總分則是將每個科目的得分加總計算而得。

Suppose there are two subjects, which have weights of 6 and 8 respectively. If Hoki has raw marks of 10 in the first subject and 5 in the second subject, what is his total score?

假設有兩個科目，其權重分別為 6 和 8。如果 Hoki 在第一科的原始分數為 10 分，在第二科的原始分數為 5 分，請問他的總分是多少？

Answer 答案 I 1 mark 分

Given that there are N subjects, let the weight of the i^{th} subject and the raw mark of Hoki in the i^{th} subject be W_i and S_i respectively. The function `g()` calculates the total score of Hoki. Complete the program below so that it returns the correct total score of Hoki.

已知共有 N 個科目，設第 i 個科目的權重以及 Hoki 在第 i 個科目的原始分數分別為 W_i 和 S_i 。函數 `g()` 將計算 Hoki 的總分。請完成下方的程式，使其能傳回正確的 Hoki 的總分。

C++

```
int g(int N, vector<int> W, vector<int> S) {
    int total = 0;
    for (int i = 0; i < N; ++i)
        total +=         J        ;
    return total;
}
```

Answer 答案 J 1.5 marks 分