



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 1 卷一

Time Allowed 限時 50 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	10	10
B 乙	Short Questions 短答題	6 A - F	9
C 丙	Long Questions 長填充題	1 G - K	6
Total 總分			25

- The term “arrays” in Paper 1 generally refers to lists in Python.
卷一提及的「陣列」泛指 Python 語言的串列。
- 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
10	10

- 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？

Python

```
print(1 + 1, end="")
```

C++

```
int main() {  
    cout << 1 + 1;  
}
```

- A 1
B 2
C 10
D 11
- 2 Which of the following(s) is/are correct?
以下哪些是正確的？
- i. Bubble sort requires comparison between two adjacent elements in an array.
冒泡排序需要比較陣列中相鄰的兩個元素。
 - ii. Quicksort is always faster than merge sort.
快速排序總是比合併排序快。
 - iii. Selection sort involves divide and conquer.
選擇排序應用了分治法。
- A i only
只有 i
B ii only
只有 ii
C i and ii only
只有 i 和 ii
D i and iii only
只有 i 和 iii

3 Which of the following(s) is/are correct?

以下哪些是正確的？

- i. All elements in a queue must be sorted.
隊列中的元素都必須有序。
- ii. Doubly linked list enables insertion and deletion operations for any elements in the data structure in constant time.
雙向鏈表支持在常數時間內運行的插入元素和刪除元素的操作。
- iii. Stack is a last-in-first-out data structure.
棧是一個後進先出的數據結構。

A i and ii only

只有 i 和 ii

B i and iii only

只有 i 和 iii

C ii and iii only

只有 ii 和 iii

D i, ii and iii

i、ii 和 iii

4 Which of the following(s) is/are correct?

以下哪些是正確的？

- i. Binary search can be applied only when the target element exists in the array.
二分檢索只能在目標元素存在於陣列中時使用。
- ii. Binary search is always faster than linear search.
二分檢索總是比線性檢索快。
- iii. Binary search can be applied to determine if a specific element exists in a sorted array.
二分檢索可用於判斷某特定元素是否存在於已排序的陣列中。

A i only

只有 i

B iii only

只有 iii

C i and ii only

只有 i 和 ii

D ii and iii only

只有 ii 和 iii

- 5 Which of the following is equivalent to $(A \text{ AND NOT } B) \text{ OR } B$?
以下哪個布爾表達式等價於 $(A \text{ AND NOT } B) \text{ OR } B$?
- A $A \text{ AND } (\text{NOT } B \text{ OR } B)$
B $A \text{ OR } B$
C $\text{NOT}(\text{NOT } A \text{ AND } B) \text{ OR } B$
D $(A \text{ AND } B) \text{ OR NOT } B$
- 6 Let A be a sequence such that $A_0 = 0$, $A_1 = 1$ and $A_i = A_{i-1} + A_{i-2}$ for $i \geq 2$. What is the value of A_9 ?
設 A 為滿足 $A_0 = 0$ 、 $A_1 = 1$ ，且對於 $i \geq 2$ ， $A_i = A_{i-1} + A_{i-2}$ 的序列。請問 A_9 的值是甚麼？
- A 9
B 21
C 34
D 55
- 7 If it is rainy today, Hoki will not go cycling. If Hoki goes cycling, he will get hurt. If Hoki gets hurt, he will not get a good result in the examination. Which of the following(s) must be true?
如果今天下雨，Hoki 就不會去踩單車。如果 Hoki 去踩單車，他就會受傷。如果 Hoki 受傷，他就不能在考試中取得好成績。以下哪些必定為真？
- i. If Hoki gets hurt, it is not rainy today.
如果 Hoki 受傷，那麼今天就沒有下雨。
- ii. If Hoki gets a good result in examination, he doesn't go cycling.
如果 Hoki 在考試中取得好成績，他就沒有去踩單車。
- iii. If Hoki doesn't go cycling, it is rainy today.
如果 Hoki 沒有去踩單車，那麼今天就是下雨天。
- A i only
只有 i
B ii only
只有 ii
C iii only
只有 iii
D i, ii and iii
i、ii 和 iii

- 8 (a, b) is a “good” pair if and only if both a and b are odd numbers with $a < b$. How many “good” pairs are there if $1 \leq a < b \leq 10$?

(a, b) 為「好」對當且僅當 a, b 均為奇數且 $a < b$ 。若 $1 \leq a < b \leq 10$ ，一共存在多少「好」對？

- A 10
- B 15
- C 45
- D 55

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

Python

```
ans = 0
for i in range(1, 67 + 1):
    ans += i + 1
    ans -= i
print(ans, end="")
```

C++

```
int main() {
    int ans = 0;
    for (int i = 1; i <= 67; ++i) {
        ans += i + 1;
        ans -= i;
    }
    cout << ans;
}
```

- A -67
- B 0
- C 67
- D 2278

- 10 Function `rnd()` uniformly and independently returns a random integer between 0 and 3 (inclusive). Which of the following expression will uniformly and independently returns a random integer between 0 and 15 (inclusive)?

函數 `rnd()` 會均勻且獨立地隨機傳回一個在 0 和 3 之間（含）的整數。以下哪個表達式能夠均勻且獨立地隨機傳回一個在 0 和 15 之間（含）的整數？

- A `rnd() + 12`
- B `4 × rnd()`
- C `5 × rnd()`
- D `4 × rnd() + rnd()`

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

Python

```
def f():  
    print("f", end="")  
    return True  
  
def g():  
    print("g", end="")  
    return False  
  
def h():  
    print("h", end="")  
    return False  
  
if (f() or g()) and h():  
    print("i", end="")
```

C++

```
bool f() {  
    cout << "f";  
    return true;  
}  
  
bool g() {  
    cout << "g";  
    return false;  
}  
  
bool h() {  
    cout << "h";  
    return false;  
}  
  
int main() {  
    if ((f() || g()) && h())  
        cout << "i";  
}
```

Answer 答案 A 1.5 marks 分

- 2 Hoki and Jack are playing a number guessing game. In each turn, Jack will first choose an integer between 1 and 10 (inclusive). Hoki will then guess a number and Jack will reveal the difference between the chosen number and guessed number.

Hoki 和 Jack 正在玩一個猜數字遊戲。在每一輪中，Jack 會先從 1 到 10（含）之間選擇一個整數。接著，Hoki 會猜一個數字，然後 Jack 會透露他選的數字與 Hoki 猜的數字之間的差。

Jack decides to play the game for 10 turns with different chosen number for each turn. Given such information to Hoki, what is the minimum number of turns Hoki has to play before he can gurantee to know the number Jack will choose in the next turn?

Jack 打算遊玩 10 輪這個遊戲，且每一輪選擇的數字都不同。在 Hoki 得知這項資訊的情況下，他最少需要玩多少輪，才能保證知道 Jack 在下一輪將會選擇什麼數字？

Answer 答案 B 1.5 marks 分

- 3 In a rectangle of length 4 units and width 2 units, Hoki can move up or move right by a unit for each step. How many paths are there to move from the bottom-left corner to the top-right corner?

在一個長 4 單位、闊 2 單位的長方形中，Hoki 每一步可以向上移動或向右移動一單位。請問從左下角移動到右上角共有多少種不同的路徑？

Answer 答案 C 1.5 marks 分

- 4 What is the output of the following program?

以下程序的輸出是什麼？

Python

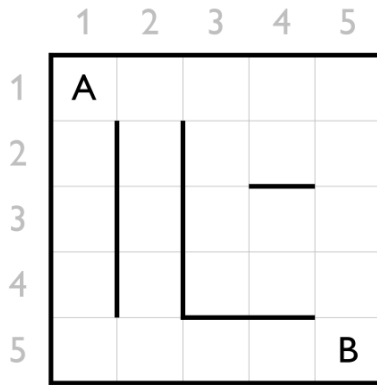
```
def rec(u):  
    if u == 0:  
        return u  
    return u + rec(u - 1)  
print(rec(4), end="")
```

C++

```
int rec(int u) {  
    if (u == 0)  
        return u;  
    return u + rec(u - 1);  
}  
int main() {  
    cout << rec(4);  
}
```

Answer 答案 D 1.5 marks 分

- 5 There is a maze which can be represented by a grid of 5×5 cells (as shown below). Hoki is currently at A and would like to reach B . In each move, he may only move to the cell to the right or the cell below. He cannot pass through the maze walls (indicated by thick line). How many different paths may he possibly take?
 這裡有一個由 5×5 格子組成的迷宮（如下圖所示）。Hoki 目前位於 A 點，並且想要前往 B 點。在每一步移動中，他只能向右或向下移動一格。他不能穿過迷宮的牆壁（以粗線標示）。請問他可能採取的不同路徑共有多少種？



Answer 答案 E 1.5 marks 分

- 6 Given that $m()$ returns a random integer between -3 and 2 (inclusive), while $n()$ returns a random integer between -1 and 1 (inclusive). What is the maximum value which can be yielded by $m() \times n()$?
 已知 $m()$ 會隨機傳回一個介於 -3 到 2 （含）之間的整數，而 $n()$ 會隨機傳回一個介於 -1 到 1 （含）之間的整數。請問 $m() \times n()$ 所能產生的最大值是多少？

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
1 G - K	6

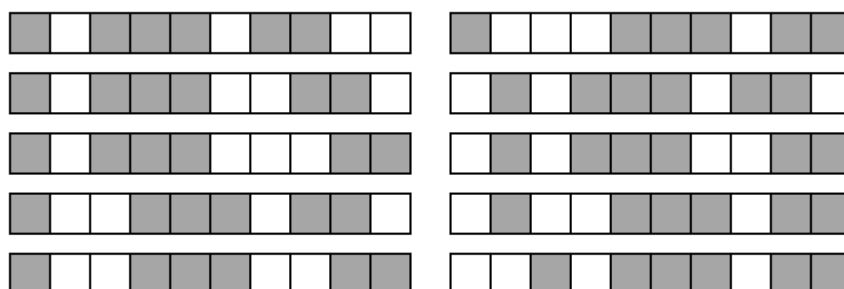
- The blanks are labeled from G to K. Please fill in the blanks on the answer sheet.
下列各空格分別命名為 G 至 K，請在答題紙上對應的地方填上答案。
- You can write only one character in each box on the answer sheet.
答題紙上每個小格只可填上一個字符。
- Answers must not exceed the designated number of boxes.
答案長度不得多於該題提供的小格數目。

- 1 A 1D nonogram of size L is a row of L cells which are filled in either black or white. Every nonogram has a hint, which is a list of numbers indicating the size of each segment of consecutive black cells. For example, the hint 1 3 2 represents 3 segments of consecutive black cells with size 1, 3, 2 respectively, separated by one or more white cells between them, with a zero or more of white cells before the first segment and after the last segment. A nonogram configuration is considered valid if and only if it satisfies all of these rules.

一個大小為 L 的一維數織 (Nonogram) 是由 L 個連成一行的格子組成，其中每個格子都被塗上黑色或白色。每個數織都有一個提示，該提示是一個數字列表，用以表示每個連續黑色格子段的大小。例如，提示 1 3 2 代表有 3 段連續的黑色格子，大小分別為 1、3、2。這些黑色格子段之間必須由一或多個白色格子隔開，而第一段之前與最後一段之後則有零或多個白色格子。一個數織配置當且僅當其符合上述所有規則才會被視為合法的配置。

For example, consider a nonogram of size 10 with hint 1 3 2, there are ten valid configurations, which are shown below:

例如，對於一個大小為 10、提示為 1 3 2 的數織，所有十種合法的配置方式如下所示：



How many white cells are in a nonogram of size 10 if the hint is 1 1 3?

如果提示為 1 1 3，一個大小為 10 的數織中共有多少個白色格子？

Answer 答案 G 1 mark 分

If the hint of a nonogram with size 10 is 1 3 1 1, how many valid configurations are there?

如果一個大小為 10 的數織，其提示為 1 3 1 1，請問共有多少種合法的配置？

Answer 答案 H 1 mark 分

Given that the hint of a nonogram with size 10 is 2 1 1 x . If there is exactly one valid configuration for the nonogram, what is the value of x ?

已知一個大小為 10 的數織，其提示為 2 1 1 x 。如果該數織恰好只有一種合法的配置，請問 x 的值是多少？

Answer 答案 I 1 mark 分

Given that there is a nonogram of size L having a hint of N segments. The size of the first $N - 1$ segments are stored in `H`. However, the size of the N^{th} segment is unknown. The function `f()` returns the size of the N^{th} segment such that the nonogram has exactly one valid configuration. If no such segment size can produce a valid configuration, the function should return `-1` instead. Complete the program so that it returns the correct value.

已知有一個大小為 L 的數織，且其提示包含 N 段。前 $N - 1$ 段的大小已儲存於 `H` 中。然而，第 N 段的大小是未知的。函數 `f()` 將傳回第 N 段的大小，使得該數織恰好只有一種合法的配置方式。如果沒有任何一個段的大小能產生恰好一種合法配置，則該函數應傳回 `-1`。請完成程式，使其能傳回正確的數值。

Python

```
def f(L, N, H):
    sum = 0
    for i in range(N - 1):
        sum += H[i] + 1
    answer = _____
    if answer > 0:
        return answer
    return -1
```

C++

```
int f(int L, int N, vector<int> H) {
    int sum = 0;
    for (int i = 0; i < N - 1; ++i)
        sum += H[i] + 1;
    int answer = _____;
    if (answer > 0)
        return answer;
    return -1;
}
```

Answer 答案 _____ J 1 mark 分

Now, consider another nonogram of size L , where the hint contains N segments of known size. The function `g()` determines the flexibility of the nonogram. If there is no valid configuration, the function should return `0`. If there is exactly one valid configuration, it should return `1`. If there are more than one valid configurations, it should return `2`. Complete the program so that it returns the correct value.

現在，考慮另一個大小為 L 的數織，其提示包含 N 個已知大小的段。函數 `g()` 將判斷該數織的變化可能性。如果沒有任何合法的配置方式，函數應傳回 `0`；如果恰好只有一種合法的配置方式，應傳回 `1`；如果有多於一種合法的配置方式，則應傳回 `2`。請完成程式，使其能傳回正確的數值。

Python

```
def g(L, N, H):
    sum = 0
    for i in range(N):
        sum += H[i] + 1
    sum -= 1
    d = _____ K1
    if _____ K2 :
        return 0
    elif d == 0:
        return 1
    else:
        return 2
```

C++

```
int g(int L, int N, vector<int> H) {
    int sum = 0;
    for (int i = 0; i < N; ++i)
        sum += H[i] + 1;
    --sum;
    int d = _____ K1;
    if (_____ K2) {
        return 0;
    } else if (d == 0) {
        return 1;
    } else {
        return 2;
    }
}
```

Answer 答案 _____ K1 _____ K2 2 marks 分