

# HSMC 恒管 Computing Cup

HSMC Computing Cup

## \*\*\* Section 1. Task 比賽任務 \*\*\*

Notice: If there is any inconsistency or ambiguity between the English version and the Chinese version, the English version shall prevail.

注意：如中、英文兩個版本有任何抵觸或不相符之處，應以英文版本為準。

Design an Android mobile app with the following features:

設計一個 Android 移動應用程式，要求如下：

1. The user can input information of activities for next week. Information of each activity is entered one by one. Details of input information can be found in Section 2.  
用家可以在移動應用程式中逐個輸入下星期活動的資料。活動的資料格式請參閱第 2 部份。
2. The APP provides a ‘Generate Schedule’ function that generates the schedule of next week automatically. The user can view the schedule using the APP. Details of functional objective of the schedule can be found in Section 3.  
移動應用程式有一個「安排時間表」的功能，移動應用程式會自動計算一個適合用家下星期的時間表。用家可以在移動應用程式中查看計算出來的時間表。更多關於功能時間表的功能請參閱第 3 部份。
3. There is an import feature which reads a text file (“ .txt” file) which contains information of all activities. File format details can be found in Section 4.  
移動應用程式有一個匯入功能，使得它讀取一個純文字文件(“.txt” 檔案)。這個文件包含活動的所有信息，格式詳情請參閱第 4 部份。
4. There is an export feature which outputs a text file (“ .txt” file) which contains the information of the schedule. File format details can be found in Section 5.  
移動應用程式有一個匯出功能，使得它能生成一個純文字文件(“.txt” 檔案)。這個文件包含生產出來的時間表資料，格式詳情請參閱第 5 部份。
5. The APP developed by each team will be evaluated by the following criteria.
  - Human-centred design of the APP
  - Functional objective of the APP (see Section 3)
  - Documentation

移動應用程式的評審會基於以下準則：

- 人本設計
- 功能目標得分(請參閱第 3 部份)
- 說明文件清晰度

## \*\*\* Section 2. Input Specification 輸入資料說明 \*\*\*

- 1) There are at most 1000 activities, to be scheduled next week. There are 7 days next week, denoted by “Sun”, “Mon”, “Tue”, “Wed”, “Thu”, “Fri”, “Sat”. All activities are to be held between 9:00-24:00 of a day.

用家最多輸入 1000 個活動，移動應用程式的目標是把這些活動盡可能安排在下星期進行。下個星期有 7 天，分別為 “Sun”，“Mon”，“Tue”，“Wed”，“Thu”，“Fri”，“Sat”。每一天只有 9:00-24:00 可以進行活動。

- 2) Each activity contains the following information:

每一個活動皆有以下資料：

- a. **Activity Number:** A unique identifier of each activity which is an integer starting from 1 to 1000  
**Activity Number** 是活動編號，是一個 1 到 1000 的整數，每一個活動皆會有一個不同的 Activity Number。
- b. **Activity Title:** A short text describing the activity, which contains at most 100 characters. For example, an activity title could be “Watch a movie with Sam”  
**Activity Title** 是最多 100 字的活動說明。例如 “Watch a movie with Sam” (與山姆看電影) 就是一個 Activity Title。
- c. **Priority:** A score indicating the importance of the activity and is used for evaluating the generated schedule. The score must be an integer between 1 (lowest priority) and 100 (highest priority) inclusively.  
**Priority** 代表活動的重要性，會用來計算時間表的功能目標得分。Priority 是一個 1 (最低重要性) 到 100 (最高重要性) 的整數。
- d. **Duration:** The duration of the activity. The smallest unit of measurement is in minutes. For example, the duration of the activity “Watch a movie with Sam” could be 2:15’ (2 hours and 15 minutes)  
**Duration** 是活動的長度，準確至分鐘。例如，“Watch a movie with Sam” (與山姆看電影) 這個活動的 Duration 可以是 2:15’ (2 小時 15 分鐘)
- e. **Available period(s):** Each activity can only be scheduled in the available periods. Each available period is specified by the format “[Day] [Begin Time]-[End Time]”. For example, “Mon 13:00-17:00” means the activity can be scheduled on Monday, between 13:00 and 17:00. There are at most 100 available periods of each activity.  
**Available period(s)** 是可供選擇進行活動的時段。每個活動最多可以有 100 個不同的時段給移動應用程式選擇進行該活動。每個 Available period 都會用以下格式表達：「[日期] [時段開始時間]-[時段結束時間]」。例如：“Mon 13:00-17:00” 代表活動可以在星期一(Mon) 下午一時至五時進行。
- f. **Prerequisite(s):** Some activity must be done after certain activities are done. For example, you should apply for your passport (activity 1) before

you can pick it up (activity 2). The prerequisite of activity 2 is 1 (the activity number of prerequisite activity). There are at most 5 prerequisites of an activity.

**Prerequisite(s)** 是這個活動進行前的先決條件。有一些活動必需在其他一些活動後進行，例如：你必需先進行護照申請(activity 1)，才可以獲得護照(activity 2)。Activity 2 的 Prerequisite 便是 1 (Activity 1 的 Activity Number)。一個活動的 Prerequisite 最多有 5 個。

3) Three sample activities are shown below.

以下有三個活動資料的例子

Example activity 1:

活動範例 1：

|                             |                        |                  |       |
|-----------------------------|------------------------|------------------|-------|
| <b>Activity Number:</b>     | 1                      | <b>Priority:</b> | 60    |
| <b>Activity Title:</b>      | Watch a movie with Sam | <b>Duration:</b> | 2:15' |
| <b>Available period(s):</b> |                        |                  |       |
| Mon 13:20-15:35             | Mon 19:25-21:40        | Tue 11:00-13:15  |       |
| <b>Prerequisite(s):</b>     |                        |                  |       |
| Nil                         |                        |                  |       |

Example activity 2:

活動範例 2：

|                             |                    |                  |                 |
|-----------------------------|--------------------|------------------|-----------------|
| <b>Activity Number:</b>     | 2                  | <b>Priority:</b> | 80              |
| <b>Activity Title:</b>      | Apply for passport | <b>Duration:</b> | 1:00'           |
| <b>Available period(s):</b> |                    |                  |                 |
| Mon 13:00-18:00             | Tue 13:00-18:00    | Wed 13:00-18:00  | Thu 13:00-18:00 |
| Fri 13:00-18:00             |                    |                  |                 |
| <b>Prerequisite(s):</b>     |                    |                  |                 |
| Nil                         |                    |                  |                 |

Example activity 3:

活動範例 3：

|                             |                     |                  |                 |
|-----------------------------|---------------------|------------------|-----------------|
| <b>Activity Number:</b>     | 3                   | <b>Priority:</b> | 80              |
| <b>Activity Title:</b>      | Pick up my passport | <b>Duration:</b> | 1:00'           |
| <b>Available period(s):</b> |                     |                  |                 |
| Mon 13:00-18:00             | Tue 13:00-18:00     | Wed 13:00-18:00  | Thu 13:00-18:00 |
| Fri 13:00-18:00             |                     |                  |                 |
| <b>Prerequisite(s):</b>     |                     |                  |                 |
| 2                           |                     |                  |                 |

### \*\*\* Section 3. Functional objective and evaluation \*\*\*

#### \*\*\* 3. 功能要求及計分方法 \*\*\*

- 1) The functional objective will be evaluated by using test cases. Each test case contains a different set of activities to be arranged in the schedule.  
時間表的功能會以不同的個案測試和計分，每一個個案將會有不同活動要安排在時間表內。
- 2) The functional objective of the APP is to arrange the activities in the schedule **without conflict**. Two scheduled activities are said to have a **conflict** if their scheduled periods overlap. For example, if activity 1 requires 2 hours and is scheduled to start at 13:00 on Mon and activity 2 is scheduled to start at 14:00 on Mon, activity 2 starts before activity 1 ends. If the schedule has conflicted activities or any invalid activity arrangement, the team scores 0 mark for the test case.  
移動應用程式的目標是盡量安排活動在時間表內，如果兩個活動的進行時段重疊，則兩活動有衝突，不可以放在同一時間表內。例如，如果需要 2 小時的 activity 1 被安排在星期一的 13:00 開始，而 activity 2 被安排在星期一的 14:00 開始，則活動 2 在活動 1 結束之前開始，這個衝突使 activity 1 和 activity 2 不可以這樣安排在時間表中。如果時間表有任何活動之間的衝突或活動安排不正確，參賽隊伍在這個個案測試將會得到 0 分。
- 3) Not all activities are required to be arranged in the schedule. The team gets an **objective score** for each test case, which is the sum of priority of all scheduled activities. Teams should try to get as high objective score as possible without having conflicting activities in the schedule.  
並非所有活動都需要安排在時間表中。參賽隊伍在每個個案測試中的功能目標得分是所有安排好的活動的 priority 的總和。
- 4) For example, we are given the following 3 activities:  
計分方法例子：以下個案有 3 個活動

|                             |                        |                  |       |
|-----------------------------|------------------------|------------------|-------|
| <b>Activity Number:</b>     | 1                      | <b>Priority:</b> | 60    |
| <b>Activity Title:</b>      | Watch a movie with Sam | <b>Duration:</b> | 2:00' |
| <b>Available period(s):</b> |                        |                  |       |
| Mon 14:00-16:00             | Tue 12:00-14:00        |                  |       |
| <b>Prerequisite(s):</b>     |                        |                  |       |
| Nil                         |                        |                  |       |

|                             |                    |                  |       |
|-----------------------------|--------------------|------------------|-------|
| <b>Activity Number:</b>     | 2                  | <b>Priority:</b> | 10    |
| <b>Activity Title:</b>      | Apply for passport | <b>Duration:</b> | 2:00' |
| <b>Available period(s):</b> |                    |                  |       |

|                          |                 |  |  |
|--------------------------|-----------------|--|--|
| Mon 13:00-16:00          | Tue 13:00-16:00 |  |  |
| <b>Prerequisite(s) :</b> |                 |  |  |
| Nil                      |                 |  |  |

|                              |                     |                  |       |
|------------------------------|---------------------|------------------|-------|
| <b>Activity Number:</b>      | 3                   | <b>Priority:</b> | 80    |
| <b>Activity Title:</b>       | Pick up my passport | <b>Duration:</b> | 2:00' |
| <b>Available period(s) :</b> |                     |                  |       |
| Mon 13:00-16:00              | Tue 13:00-16:00     |                  |       |
| <b>Prerequisite(s) :</b>     |                     |                  |       |
| 2                            |                     |                  |       |

There are different ways to arrange the activities in the schedule. The following shows four different schedules and their corresponding objective scores  
 以下有 4 個不同的時間表和它們的得分計算方法

#### Schedule 1

|             | Mon        | Tue        |
|-------------|------------|------------|
| 12:00-13:00 |            |            |
| 13:00-14:00 |            |            |
| 14:00-15:00 | Activity 1 | Activity 2 |
| 15:00-16:00 | Activity 1 | Activity 2 |

Objective score:

$$60+10 \text{ (Priority of activity 1 + Priority of Activity 2)}$$

$$= 70$$

#### Schedule 2

|             | Mon        | Tue        |
|-------------|------------|------------|
| 12:00-13:00 | Activity 1 |            |
| 13:00-14:00 | Activity 1 |            |
| 14:00-15:00 | Activity 2 | Activity 3 |
| 15:00-16:00 | Activity 2 | Activity 3 |

Objective score:

0 (The schedule is invalid. Activity 1 cannot start at 12:00 on Monday)  
 (這個時間表不正確，因為 Activity 1 沒有一個選項可以在星期一的 12:00 開始)

#### Schedule 3

|             | Mon                      | Tue        |
|-------------|--------------------------|------------|
| 12:00-13:00 |                          |            |
| 13:00-14:00 | Activity 2               |            |
| 14:00-15:00 | Activity 1<br>Activity 2 | Activity 3 |
| 15:00-16:00 | Activity 1               | Activity 3 |

Objective score:

0 (Activity 1 conflicts with Activity 2)

Schedule 4 (One of the best solutions for this case)

(這個時間表得到這個個案的最高可能得分)

|             | Mon        | Tue        |
|-------------|------------|------------|
| 12:00-13:00 |            | Activity 1 |
| 13:00-14:00 | Activity 2 | Activity 1 |
| 14:00-15:00 | Activity 2 | Activity 3 |
| 15:00-16:00 |            | Activity 3 |

Objective score:

$60 + 10 + 80$  (Sum of priority of all activities)

$= 150$

## \*\*\* Section 4. Import file format 滙入檔案格式 \*\*\*

- 1) The import file is a simple text (“.txt”) file. It contains information of activities.

滙入文件是一個純文字 (“.txt”) 文件，它包含所有活動的資料。

- 2) The first line of the file contains one integer, which denotes the number of activities. After that, information of each activity is listed in the file.

文件的第一行是一個整數，代表活動的數量，其餘的文件列出每個活動的資料。

- 3) For each activity, it occupies 4 lines.

每一個活動會有 4 行資料。

- a. The first line contains the activity number, activity title, priority and duration, separated by “,”.

第一行包含 activity number, activity title, priority 和 duration, 全部由 “,” 分隔。

- b. The second line contains two integers separated by a space. The first integer is the number of available period(s). The second integer is the number of prerequisite(s).

第二行有兩個整數，前一個是 available period(s) 的數量，後一個是 prerequisite(s) 的數量，兩者由一個空格分隔。

- c. The third line shows all available period(s) of the activity. Each available period is presented in the format “[Day] [Begin Time]-[End Time]”. All available periods are separated by “,”.

第三行是所有 available period(s) 的資料，各個 available period 之間由 “,” 分隔，每個 available period 的格式是「[日期] [時段開始時間]-[時段結束時間]」。

- d. The last line shows the prerequisite(s), each separated by “,”. If there is no prerequisite, this line is empty.

最後一行是 prerequisite(s) 的資料，各個 prerequisite 之間由 “,” 分隔。若果沒有 prerequisite, 這一行留空。

- 4) An example of the file content is shown below.

以下是一個滙入文件內容的例子

“sample\_import.txt”

```
4
1,Borrow a travel book from library,5,1:00'
4 0
Sun 10:00-13:00,Sun 14:00-20:00,Mon 10:00-13:00,Mon 14:00-20:00

2,Haircut for wedding,8,2:00'
```



|  |
|--|
| 2 0<br>Sun 10:00-18:00, Mon 10:00-18:00  |
| 3, Buy a gift for wedding, 8, 1:00'<br>2 0<br>Sun 10:00-18:00, Mon 10:00-18:00 |
| 4, Attend the wedding banquet, 100, 3:00'<br>1 2<br>Mon 18:00-21:00<br>2, 3    |

There are 4 activities in the import file. The activities are described below.

文件中有 4 個活動，我們可以看到各個活動的資料如下

|                             |                                   |                  |                 |
|-----------------------------|-----------------------------------|------------------|-----------------|
| <b>Activity Number:</b>     | 1                                 | <b>Priority:</b> | 5               |
| <b>Activity Title:</b>      | Borrow a travel book from library | <b>Duration:</b> | 1:00'           |
| <b>Available period(s):</b> |                                   |                  |                 |
| Sun 10:00-13:00             | Sun 14:00-20:00                   | Mon 10:00-13:00  | Mon 14:00-20:00 |
| <b>Prerequisite(s):</b>     |                                   |                  |                 |
| Nil                         |                                   |                  |                 |

|                             |                     |                  |       |
|-----------------------------|---------------------|------------------|-------|
| <b>Activity Number:</b>     | 2                   | <b>Priority:</b> | 8     |
| <b>Activity Title:</b>      | Haircut for wedding | <b>Duration:</b> | 2:00' |
| <b>Available period(s):</b> |                     |                  |       |
| Sun 10:00-18:00             | Mon 10:00-18:00     |                  |       |
| <b>Prerequisite(s):</b>     |                     |                  |       |
| Nil                         |                     |                  |       |

|                             |                        |                  |       |
|-----------------------------|------------------------|------------------|-------|
| <b>Activity Number:</b>     | 3                      | <b>Priority:</b> | 8     |
| <b>Activity Title:</b>      | Buy a gift for wedding | <b>Duration:</b> | 1:00' |
| <b>Available period(s):</b> |                        |                  |       |
| Sun 10:00-18:00             | Mon 10:00-18:00        |                  |       |
| <b>Prerequisite(s):</b>     |                        |                  |       |
| Nil                         |                        |                  |       |

|                             |                            |                  |       |
|-----------------------------|----------------------------|------------------|-------|
| <b>Activity Number:</b>     | 4                          | <b>Priority:</b> | 100   |
| <b>Activity Title:</b>      | Attend the wedding banquet | <b>Duration:</b> | 3:00' |
| <b>Available period(s):</b> |                            |                  |       |
| Mon 18:00-21:00             |                            |                  |       |
| <b>Prerequisite(s):</b>     |                            |                  |       |
| 2                           | 3                          |                  |       |

### \*\*\* Section 5. Export file format 匯出檔案格式 \*\*\*

- 1) The export file is a simple text (".txt") file. It contains information of the schedule.

匯出文件是一個純文字（“.txt”）文件，它包含時間表的資料。

- 2) The first line contains one integer, representing the number of scheduled activities.

文件第一行是一個整數，代表時間表內安排了活動的數目。

- 3) Each of the following lines represents the scheduled activity in the format “[Activity number] [Day] [Start time]”.

往後的每一行是各個安排好的活動資料，格式是「[Activity number] [日期] [活動開始時間]」。

- 4) Three samples export files are given below, assuming every activity lasts 2 hours:

以下有三個匯出文件的例子(每個活動都假設需要 2 小時)

Sample 1: “sample\_export1.txt”

例子 1 :

```
3
1 Mon 14:00
2 Mon 13:00
3 Tue 14:00
```

Schedule represented in “sample\_export1.txt”

例子 1 中所代表的時間表：

|             | Mon                      | Tue        |
|-------------|--------------------------|------------|
| 12:00-13:00 |                          |            |
| 13:00-14:00 | Activity 2               |            |
| 14:00-15:00 | Activity 1<br>Activity 2 | Activity 3 |
| 15:00-16:00 | Activity 1               | Activity 3 |

Remark: this schedule scores no point because activity 1 conflicts with activity 2.

注：這個時間表不正確，因為 activity 1 和 activity 2 有衝突。

Sample 2: “sample\_export2.txt”

例子 2 :

```
3
1 Tue 12:00
2 Mon 14:00
```

3 Tue 14:00

Schedule represented in “sample\_export2.txt”

例子 2 中所代表的時間表：

|             | Mon        | Tue        |
|-------------|------------|------------|
| 12:00-13:00 |            | Activity 1 |
| 13:00-14:00 |            | Activity 1 |
| 14:00-15:00 | Activity 2 | Activity 3 |
| 15:00-16:00 | Activity 2 | Activity 3 |

Sample 3: “sample\_export3.txt”

例子 3：

3  
2 Mon 14:00  
1 Tue 12:00  
3 Tue 14:00

Schedule represented in “sample\_export3.txt”

例子 3 中所代表的時間表：

|             | Mon        | Tue        |
|-------------|------------|------------|
| 12:00-13:00 |            | Activity 1 |
| 13:00-14:00 |            | Activity 1 |
| 14:00-15:00 | Activity 2 | Activity 3 |
| 15:00-16:00 | Activity 2 | Activity 3 |

Remark: order of activities in the output file does not matter. Sample 2 and sample 3 both correspond to the same schedule.

注：文件中的活動排序不影響時間表，例子 2 和例子 3 中的時間表是一樣的。