Lab 2: Requirement Description

- **Addressing Mode 教學**
  - **影片:**
    https://youtu.be/x1sHnwEwYsY
  - **投影片：**
    https://slides.com/c34056077/2021nckumcuaddressingmode
  - **PIC18F4520 Instruction set:**
    http://technology.niagarac.on.ca/staff/mboldin/18F_Instruction_Set/
  - **PIC18F4520 datasheet:**
    https://ww1.microchip.com/downloads/en/DeviceDoc/39631E.pdf

- **基本題（70%）:**
  - 題目敘述：在 Data Memory 位址 0x100~0x108，依序存入 0x00~0x08 共 9 個數值，並利用至少一種 indirect addressing register，將前述數列反轉，後存入位址 0x110~0x118。
    例如： 將 0x108 之值 0x08 寫入 0x110
    將 0x107 之值 0x07 寫入 0x111
    ……以此類推至 0x118。
  - 評分標準：
    1. 需在影片中開啟 File Registers，並在畫面中呈現出 0x100 及 0x110 位址兩列之值。
    2. 使用至少一種 indirect addressing register。

- **進階題（30%）:**
  - 題目敘述：延續基本題之結果，將 0x100~0x108 之值累加，並將結果存入位址 0x120~0x128。
    例如： 0x100 之值 寫入 0x120
    0x100 之值 + 0x101 之值 寫入 0x121
    0x100 之值 + 0x101 之值 + 0x102 之值 寫入 0x122
    ……以此類推至 0x128。
  - 評分標準：
    1. 需在影片中開啟 File Registers，並在畫面中呈現 0x120 列之值。
    2. 其值依序應為 0x00、0x01、0x03、0x06、0x0A、0x0F、0x15、0x1C、0x24。
    3. 使用至少一種 indirect addressing register。

- **加分題（20%）：**
  - 題目敘述：在 Data Memory 位址 0x100~0x104，依序存入 0xB5、0xF3、0x64、0x7F、0x98 共 5 個數值，並利用至少一種 indirect addressing register 實作排序演算法，將上述五個數值由小到大排列後，將結果依序存入位置 0x100~0x104。
  - 評分標準：
    1. 同學需在影片中呈現排序前數值的狀況（即圖一）。
    2. 會檢查排序的正確性（如圖二）。
    3. 使用至少一種 indirect addressing register。
  - 提示：排序元素個數不變。

Address	00	01	02	03	04
100	B5	F3	64	7F	98

圖一

Address	00	01	02	03	04
100	64	7F	98	B5	F3

圖二

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- **Addressing Mode Guideline**
  - **Video:** https://youtu.be/x1sHnwEwYsY
  - **Slide：** https://slides.com/c34056077/2021nckumcuaddressingmode
  - **PIC18F4520 Instruction set:** http://technology.niagarac.on.ca/staff/mboldin/18F_Instruction_Set/
  - **PIC18F4520 datasheet:** https://ww1.microchip.com/downloads/en/DeviceDoc/39631E.pdf

- **Basic (70%):**
  - Description: Initialize 9 ascending numbers 0x00~0x08 into 0x100~0x108 in Data Memory. By applying indirect addressing register, reverse the previous data (in 0x100~0x108) then write into 0x110~0x118. E.g. the number 0x08 in 0x108 is written into 0x110.
  - Standard of grading:
    1. You need to show two rows of File Registers, 0x100s and 0x110s.
    2. You should use at least one of the indirect addressing register.

- **Advanced (30%):**
  - Description: Following the result of Basic question, accumulating the data from 0x100~0x108 then store the results into 0x120~0x128.
    E.g. [0x100] -> 0x120
    [0x100] + [0x101] -> 0x121
    [0x100] + [0x101] + [0x102] ->0x122
    … so on.
  - Standard of grading:
    1. You need to show the 0x120s row in File Registers.
    2. The sequence of the data is supposed to be 0x00, 0x01, 0x03, 0x06, 0x0A, 0x0F, 0x15, 0x1C, 0x24.
    3. You should use at least one of the indirect addressing register.

- **Bonus (20%):**
  - Description: Initialize the following 5 numbers (0xB5, 0xF3, 0x64, 0x7F, 0x98) at 0x100~0x104 in Data Memory. Implement a sorting algorithm to sort the values and store the results at 0x100~0x104 in ascending order.
  - Standard of grading:
    1. You need to show those 5 values before sorting (as Figure 1).
    2. You must make sure that the values are sorted properly (as Figure 2).
    3. You should use at least one indirect addressing register.
  - Hint: The number of the values is fixed. You do not have to consider the situation when the number of the values is changed.

Address	00	01	02	03	04
100	B5	F3	64	7F	98

Figure 1

Address	00	01	02	03	04
100	64	7F	98	B5	F3

Figure 2