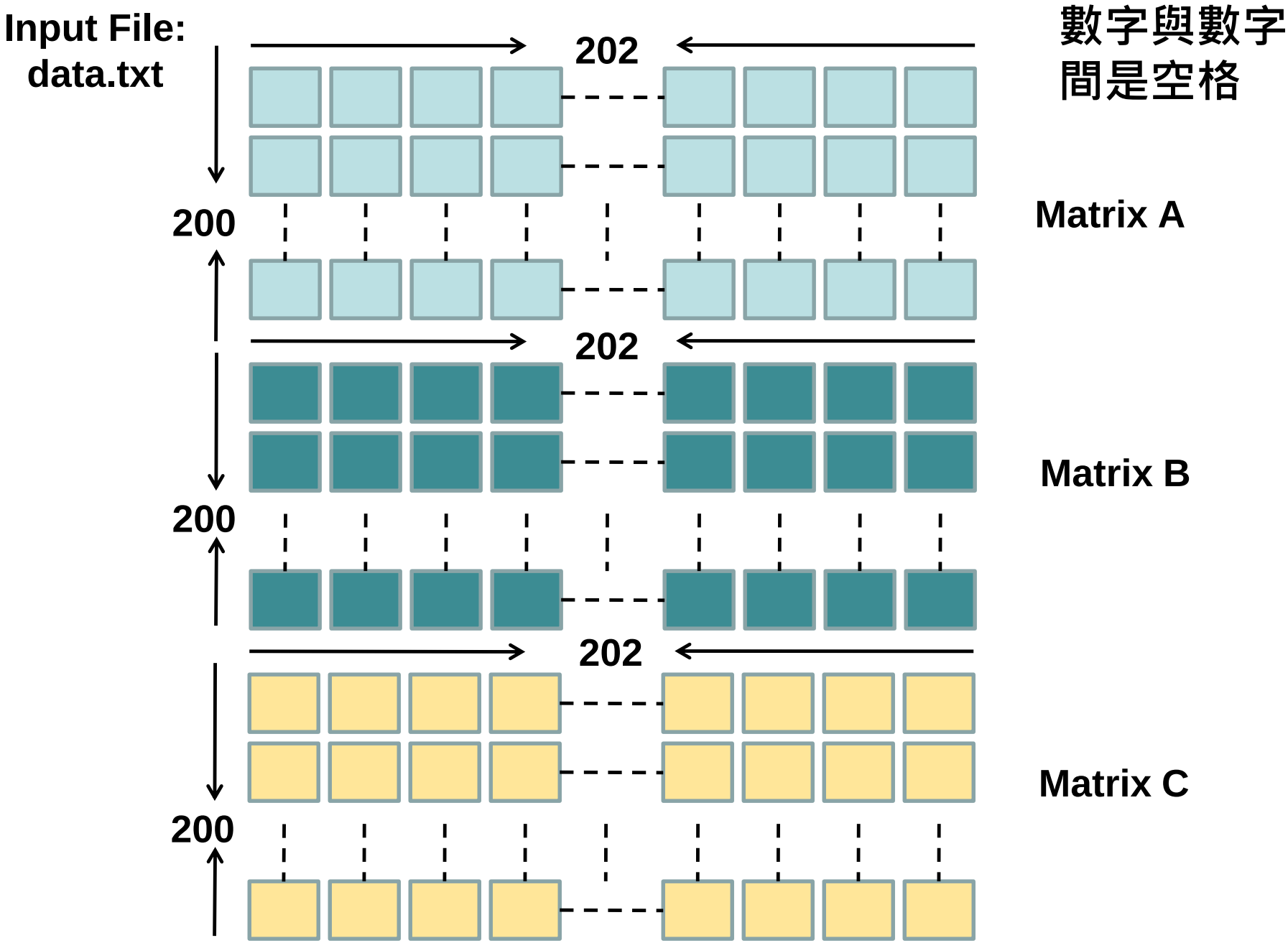
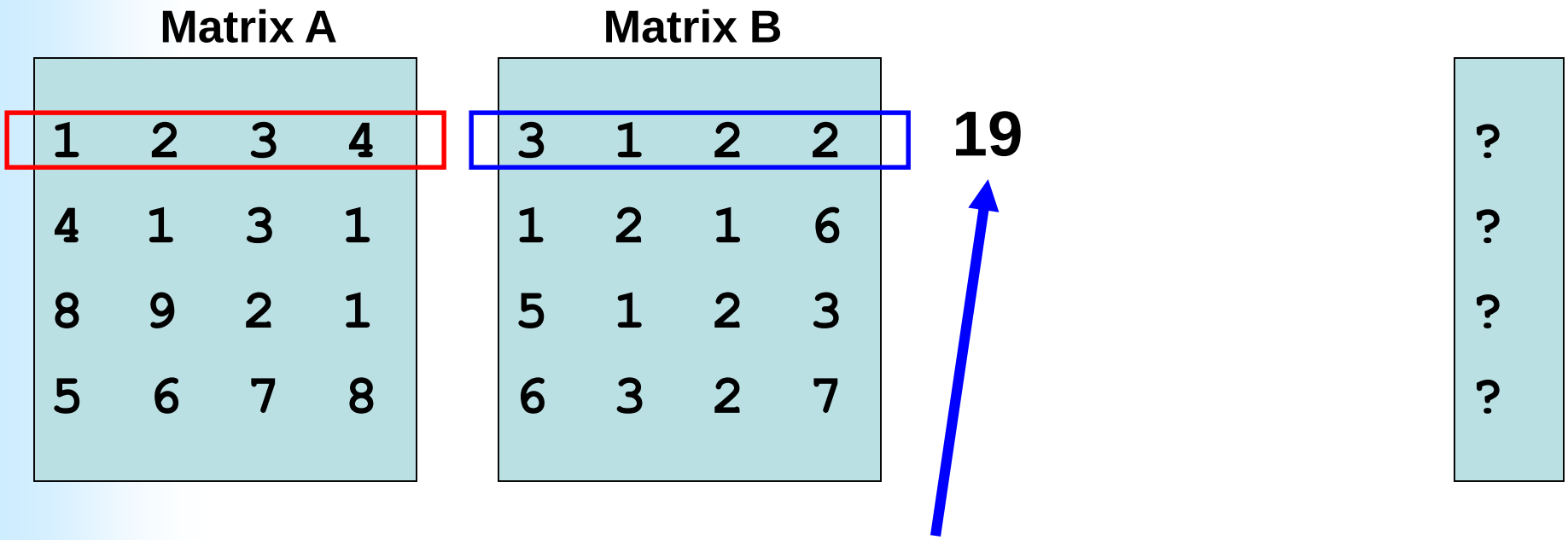
Homework #8 (1)

- **Write a C program to perform:**
  - Read a text file named "**data.txt**" which contains
    - A matrix **A**, each element is a **float data type**
    - A matrix **B**, each element is a **float data type**
    - A matrix **C**, each element is a **float data type**


Input File:
data.txt
202
200
Matrix A
202
200
Matrix B
202
200
Matrix C
數字與數字
間是空格

Homework #8 (2)

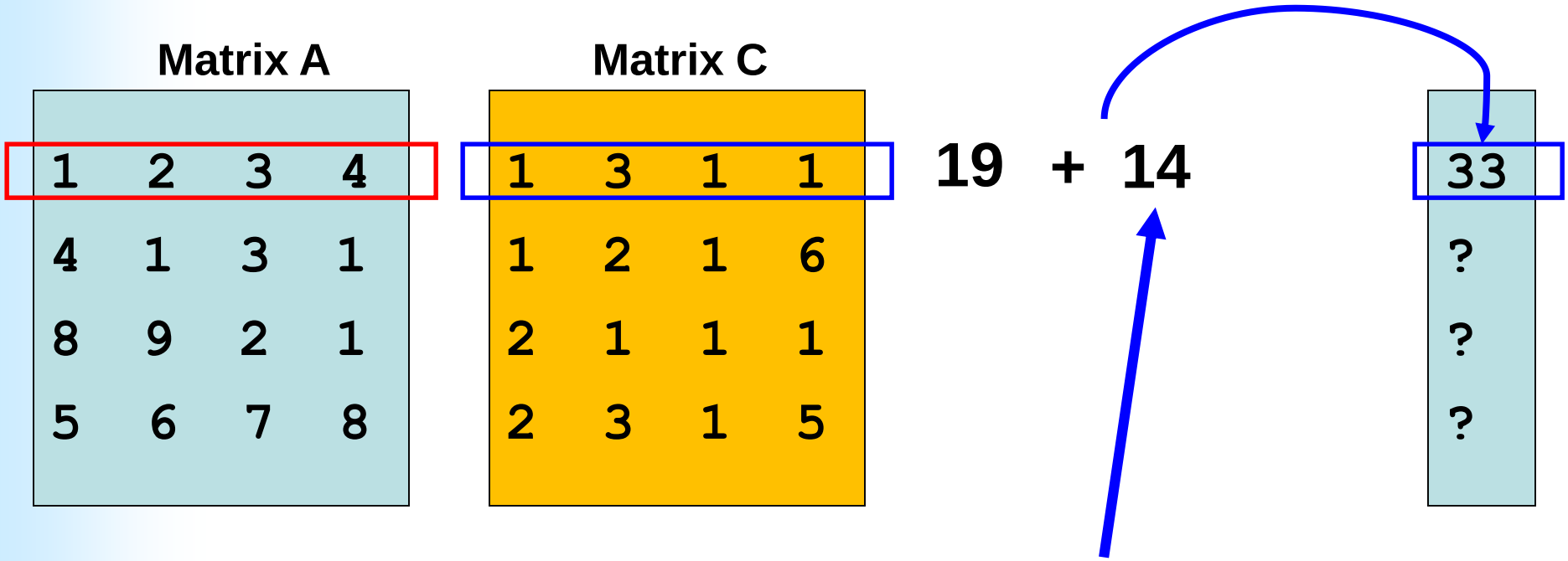
– Do following computation



1*3 + 2*1 + 3*2 + 4*2 = 3 + 2 + 6 + 8 = 19

Homework #8 (3)

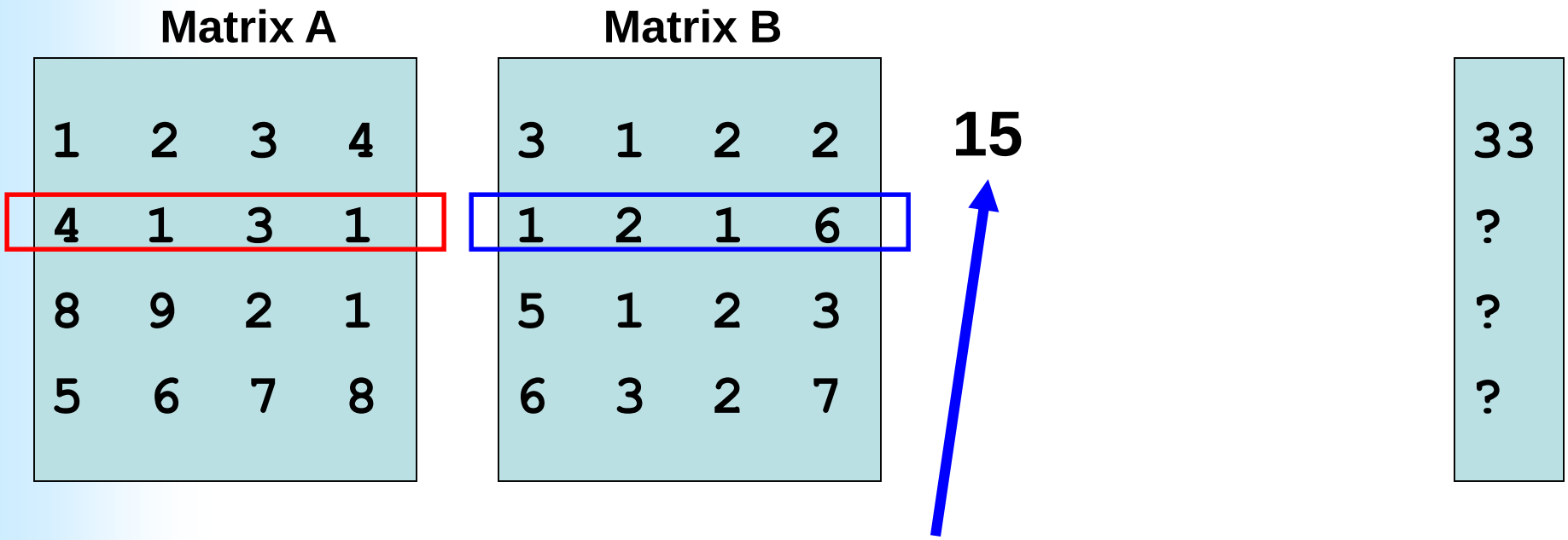
– Do following computation



1*1 + 2*3 + 3*1 + 4*1 = 1 + 6 + 3 + 4 = 14

Homework #8 (4)

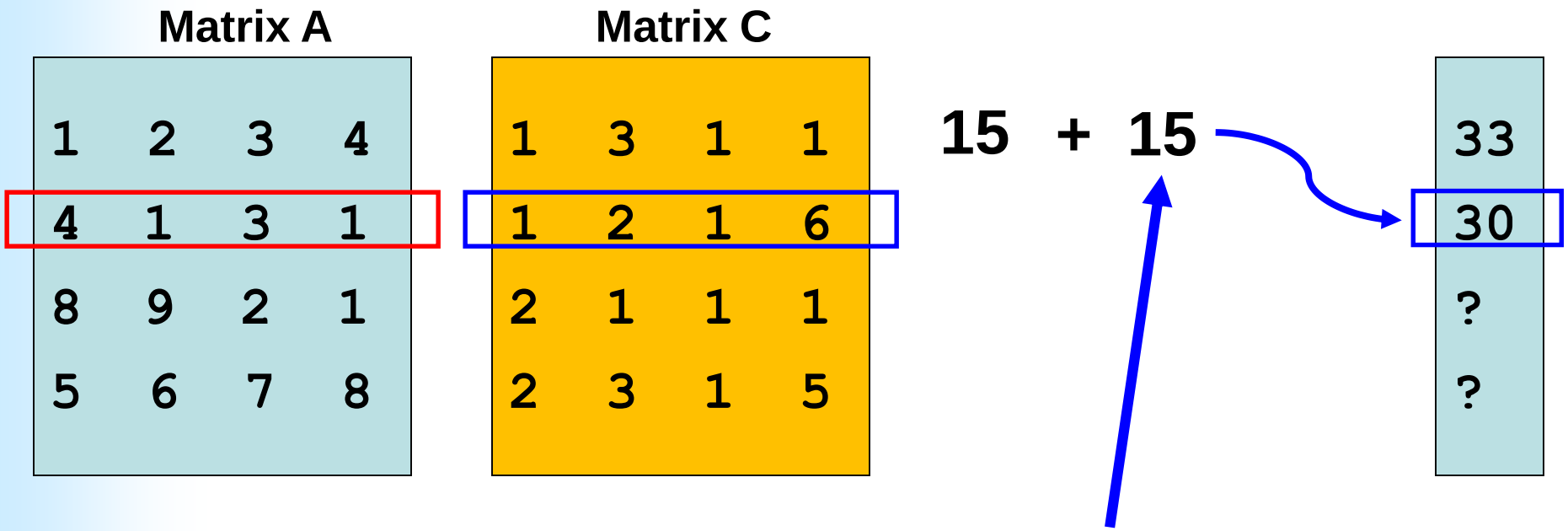
– Do following computation



4*1 + 1*2 + 3*1 + 1*6 = 4 + 2 + 3 + 6 = 15

Homework #8 (5)

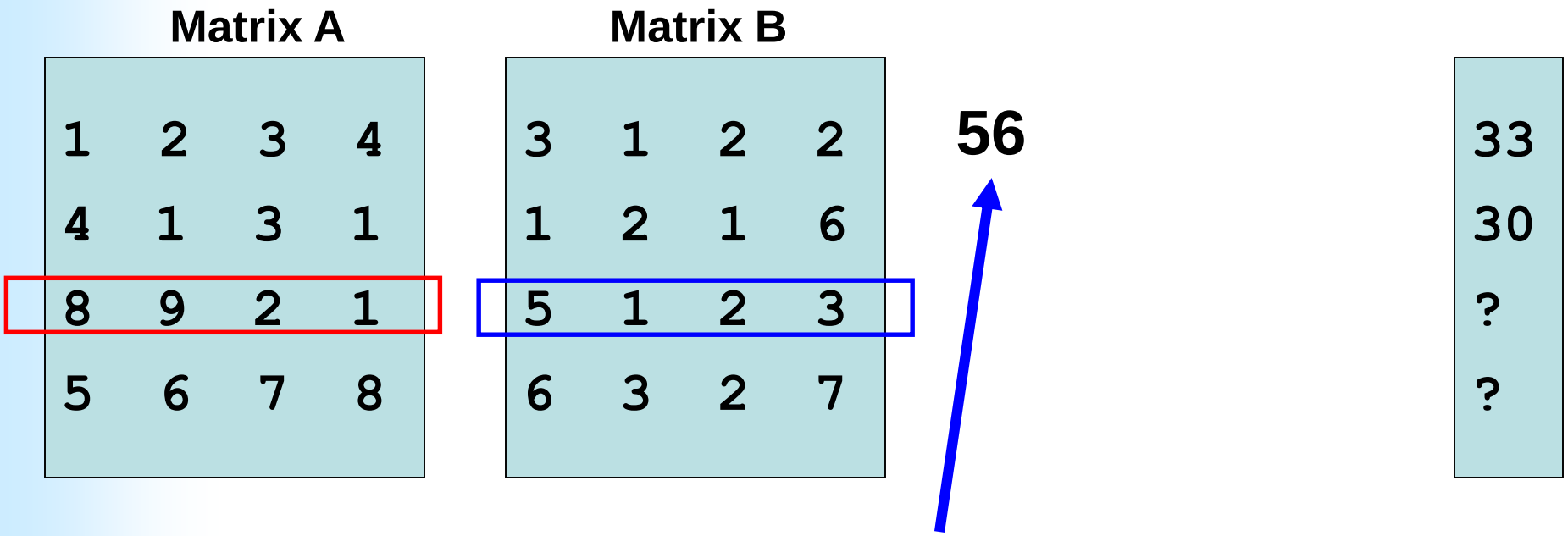
– Do following computation



4*1 + 1*2 + 3*1 + 1*6 = 4 + 2 + 3 + 6 = 15

Homework #8 (6)

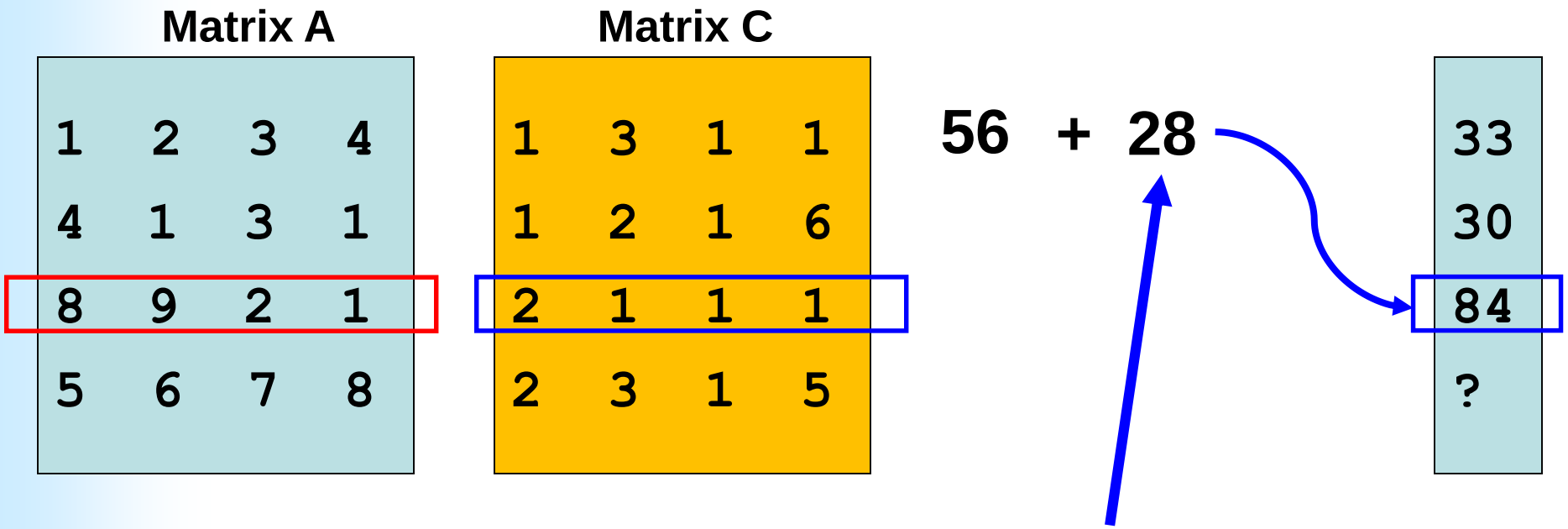
– Do following computation



8*5 + 9*1 + 2*2 + 1*3 = 40 + 9 + 4 + 3 = 56

Homework #8 (7)

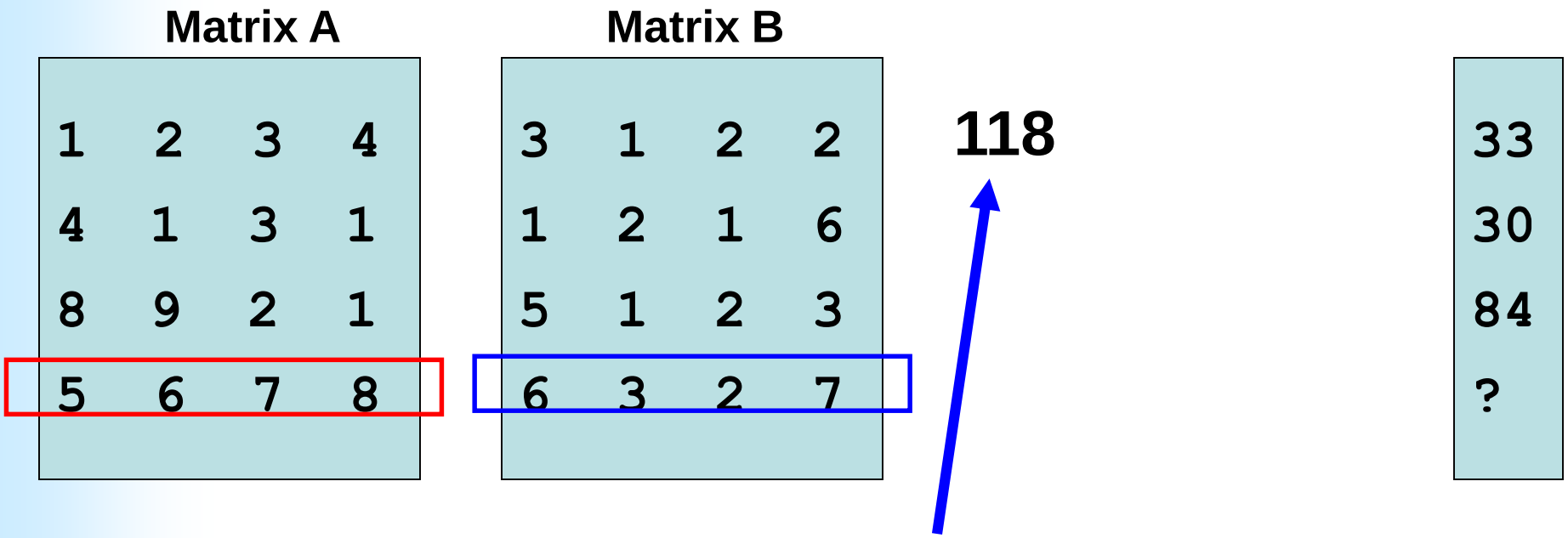
– Do following computation



8*2 + 9*1 + 2*1 + 1*1 = 16 + 9 + 2 + 1 = 28

Homework #8 (8)

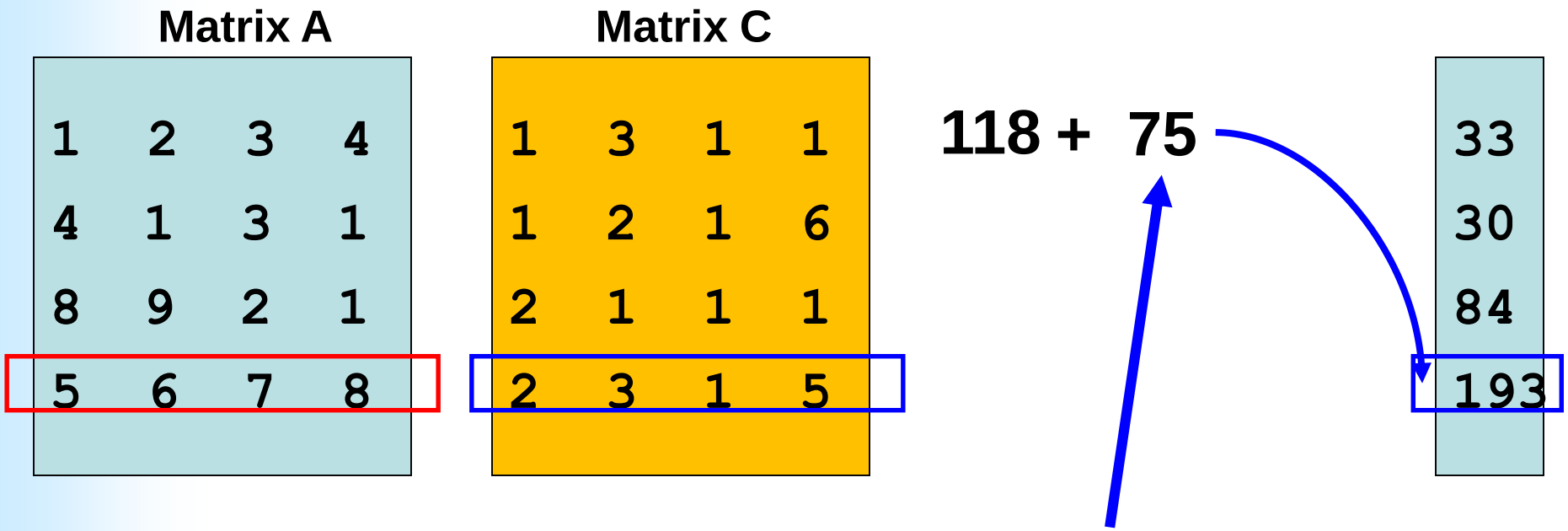
– Do following computation



5*6 + 6*3 + 7*2 + 8*7 = 30 + 18 + 14 + 56 = 118

Homework #8 (9)

– Do following computation



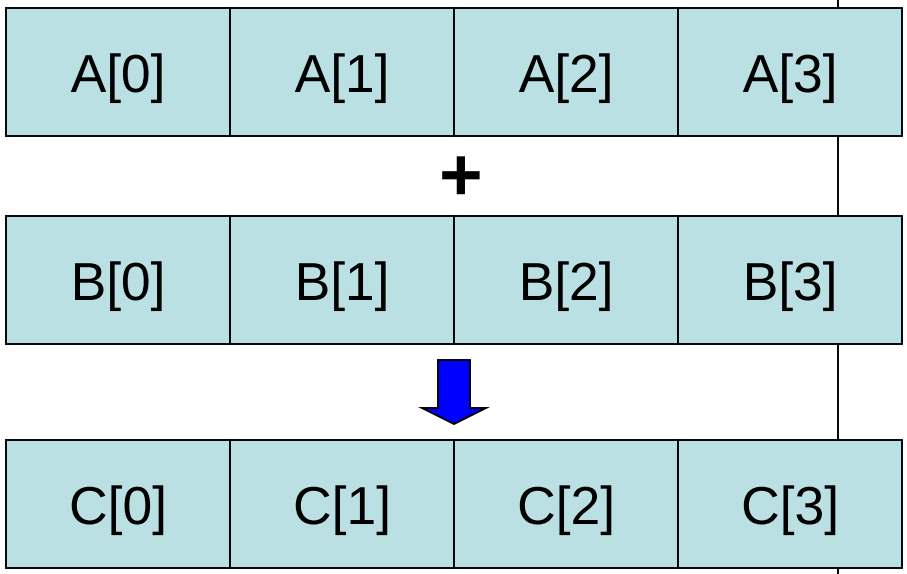
5*2 + 6*3 + 7*1 + 8*5 = 10 + 18 + 7 + 40 = 75

Homework #8 (10)

- 輸入檔檔名 data.txt (自行產生)
  - 包含600 row的資料
  - 每一row有202個floating point數字，數字與數字間用一個空白隔開
- 輸出檔檔名 output.txt (計算結果)
  - 包含200 row的資料

Example

```
#include <mmintrin.h>
#include <xmmintrin.h>
#include <stdio.h>

int main(void)
{
  float A[4] __attribute__ ((aligned(16)));
  float B[4] __attribute__ ((aligned(16)));
  float C[4] __attribute__ ((aligned(16)));
  __m128 *a, *b, *c;

  a = (__m128*) A;
  b = (__m128*) B;
  c = (__m128*) C;

  *c = _mm_add_ps(*a, *b);

  printf("%f  %f  %f  %f\n", C[0], C[1], C[2], C[3]);

  return 0;
}
```



GCC Options

- These switches enable or disable the use of built-in functions that allow direct access to the MMX, SSE, SSE2, SSE3, SSE4, AVX, and 3Dnow extensions of the instruction set
  - -mavx
  - -msse
  - -msse2
  - -msse3
  - -msse4
  - -m3dnow

```
gcc -msse4 test.c
```

Intrinsic Functions

- 你可以使用 SSE, SSE2, SSE3, SSE4等 相關的 intrinsic functions (請參閱cref_cls.pdf文件裡 page 88, 124, 168裡面的函式說明)
- 或請至下面的網站查詢有哪些intrinsic functions
  - https://software.intel.com/sites/landingpage/IntrinsicsGuide/#
  - https://software.intel.com/en-us/node/524038

Homework #8 (11)

- 使用SIMD intrinsic function來做計算
  - **請使用GCC 3.4以上的版本編譯你的程式**
  - **主要評分標準：**
    - **是否使用大量的SIMD intrinsic function？**
    - **程式執行速度？**
- 在Linux上進行編譯與測試
  - 請多利用系上工作站
- 程式中應有適當的說明（註解）

Homework #8 (12)

- You should turn in to **ECOURSE**
  - "**README.txt**" file: 文字檔，描述你程式的內容、如何編譯程式、如何執行你的程式、GCC編譯器版本、GCC編譯參數、**在哪個型號的CPU上執行成功**等等。
  - 一個可以執行成功的input檔案"data.txt"與相對應的結果檔案"output.txt"
  - A C program without SIMD intrinsic functions: hw8.c
  - A C program with SIMD intrinsic functions: hw8simd.c
  - Makefile
  - "**README.txt**" file: 文字檔，須包含使用data.txt時，hw8.c的執行時間，hw8simd.c的執行時間。
- **Deadline: January 17 (Wednesday), 24:00, 2018**

這時間之後，將無法補交這次作業