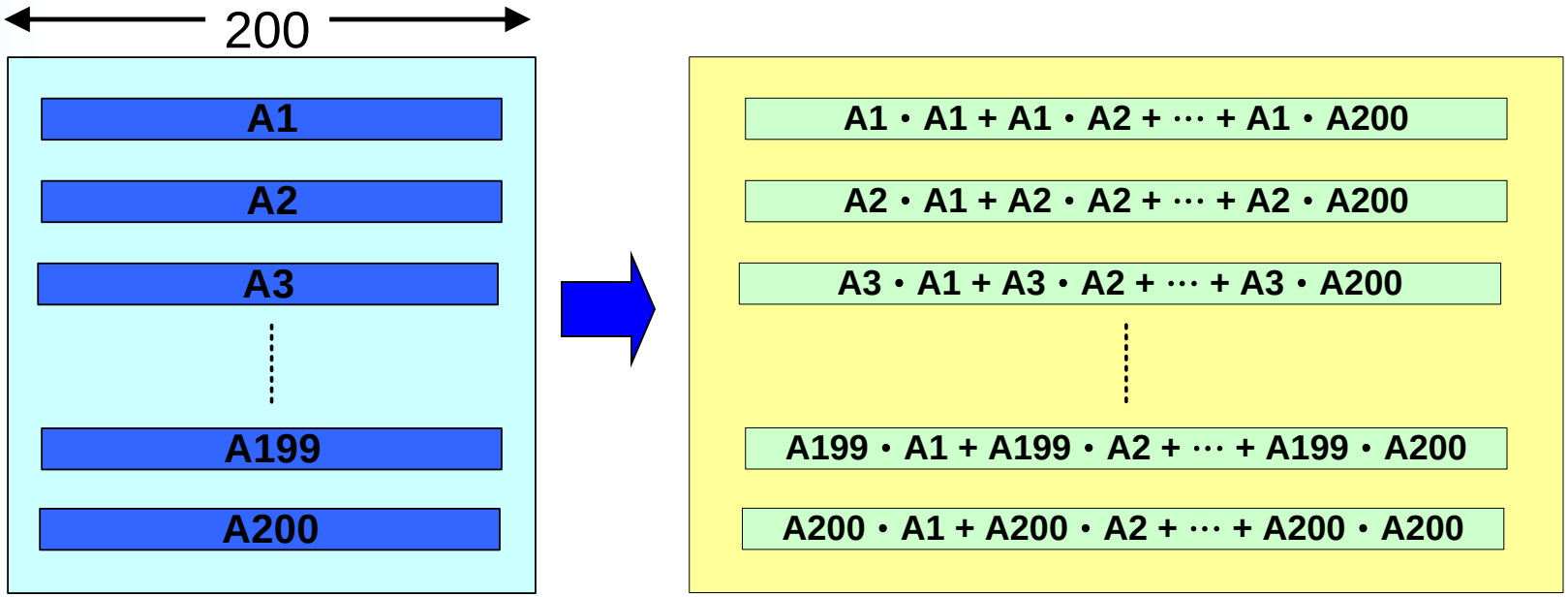
Homework #8 (1)

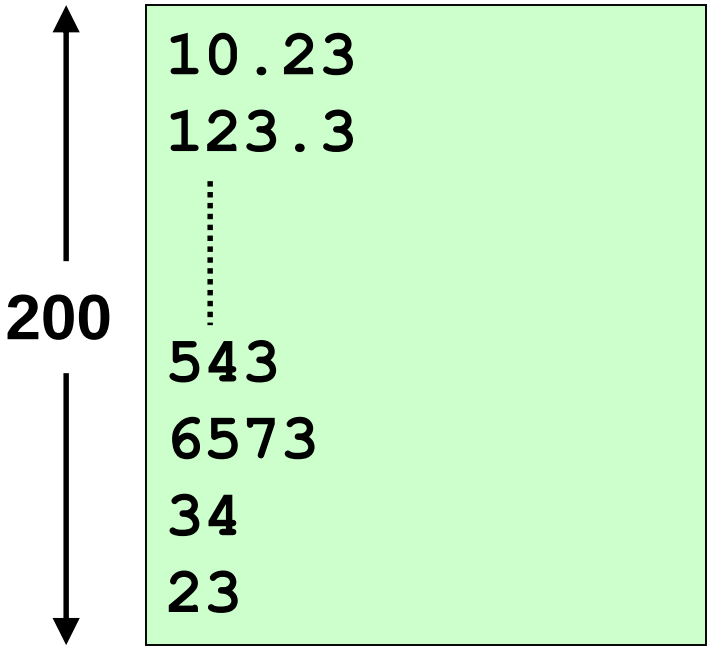
- Write a C program to perform:
  - Read a text file named "**data.txt**" (200x200 matrix, each element is a **float**)
  - Do following computation



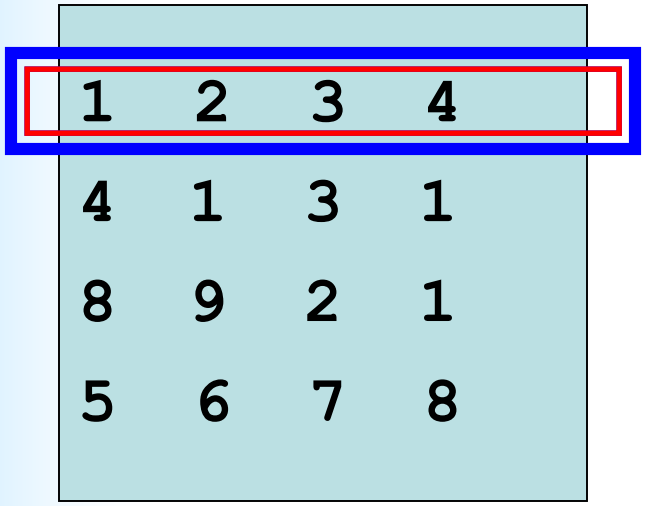
Homework #8 (2)

– Output the result to a file named “output.txt”

- Output file needs to follow the form:



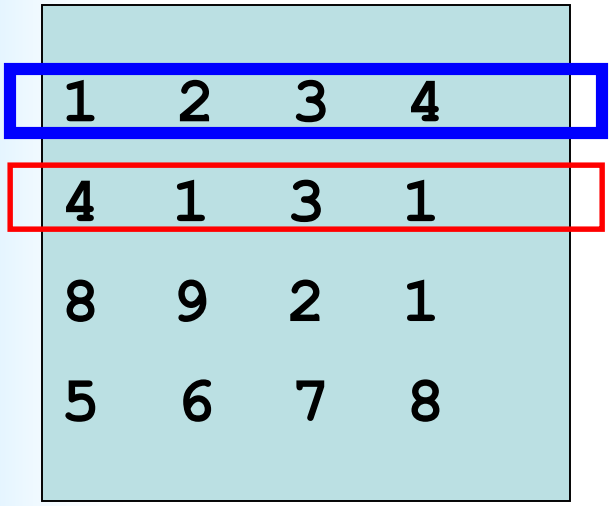
Homework #8 (3)



30

$$1x1 + 2x2 + 3x3 + 4x4 = 1 + 4 + 9 + 16 = 30$$

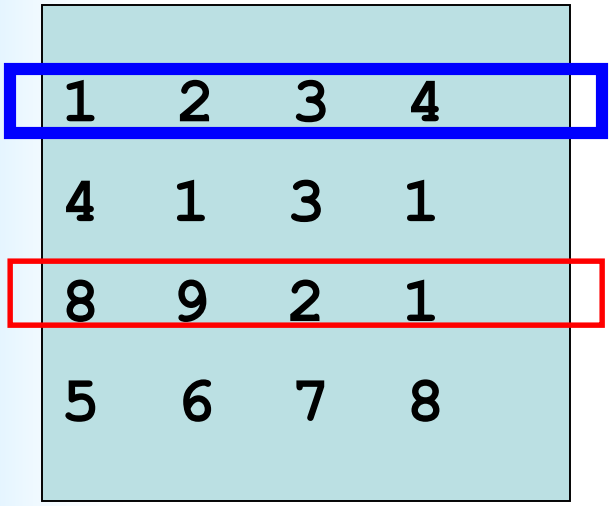
Homework #8 (3)



30 + 19

1x4 + 2x1 + 3x3 + 4x1 = 4 + 2 + 9 + 4 = 19

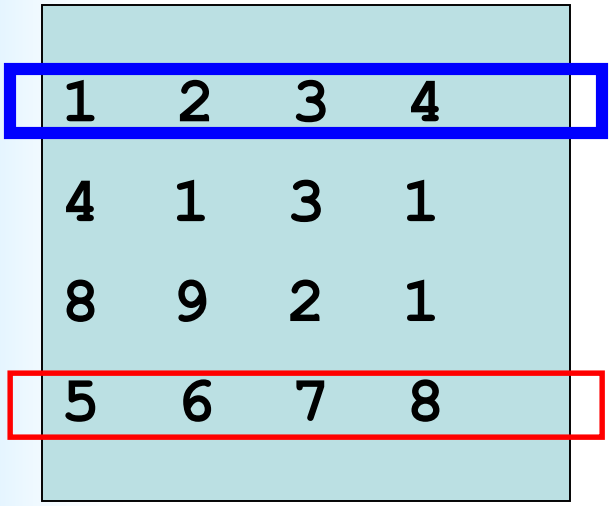
Homework #9 (3)



30 + 19 + 36

1x8 + 2x9 + 3x2 + 4x1 = 8 + 18 + 6 + 4 = 36

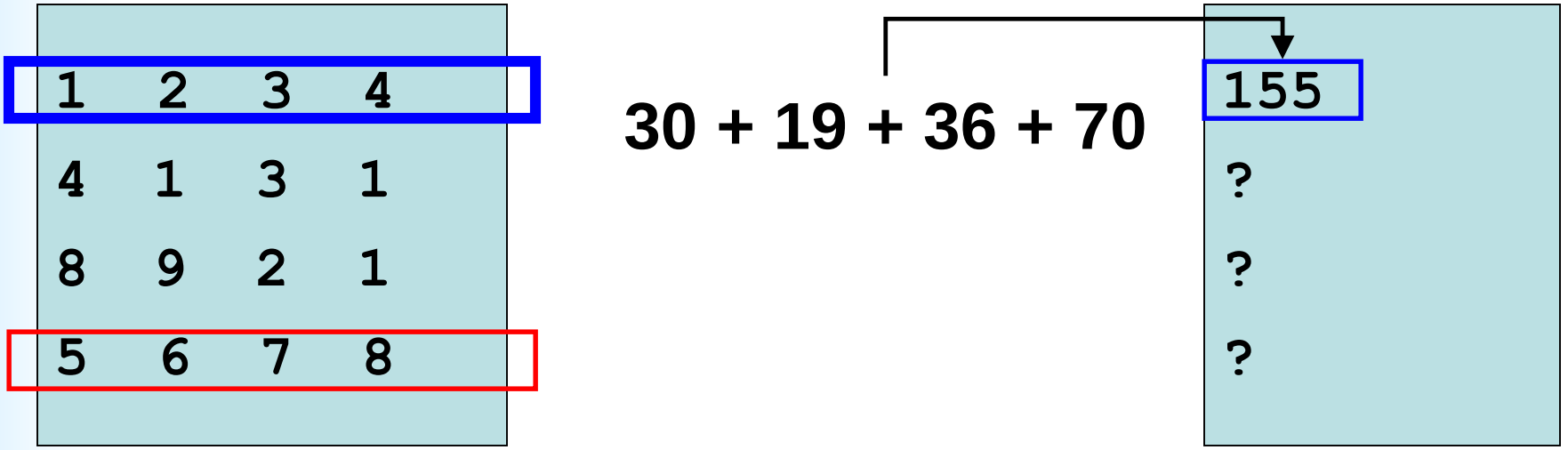
Homework #8 (3)



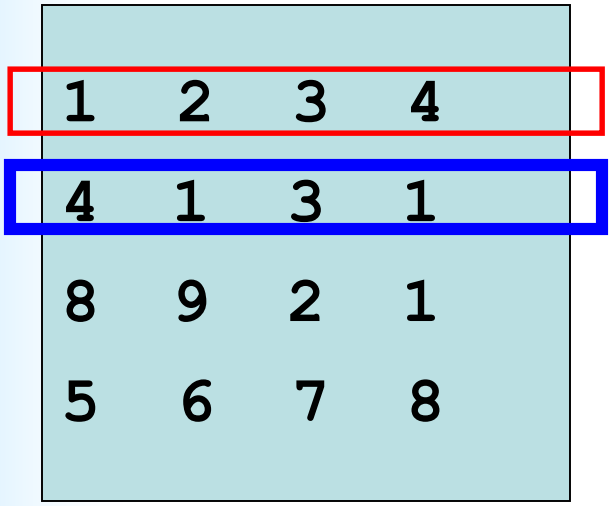
30 + 19 + 36 + 70

1x5 + 2x6 + 3x7 + 4x8 = 5 + 12 + 21 + 32 = 70

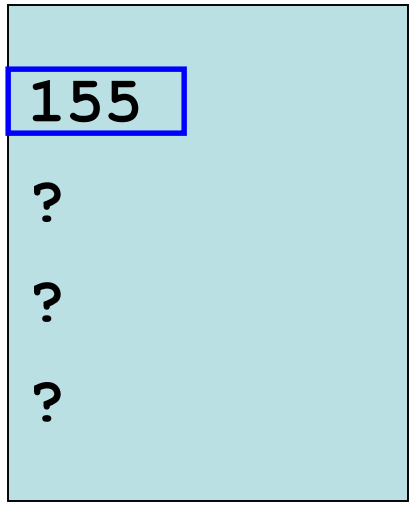
Homework #8 (3)



Homework #8 (3)

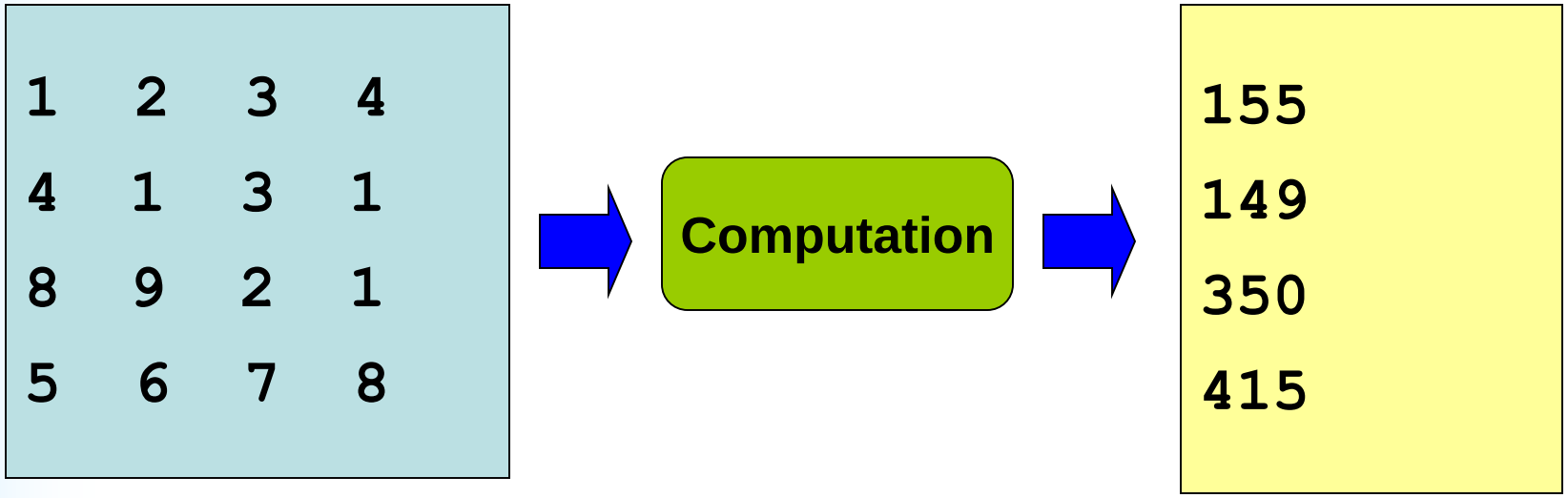


19



$$4x1 + 1x2 + 3x3 + 1x4 = 4 + 2 + 9 + 4 = 19$$

Homework #8 (3)



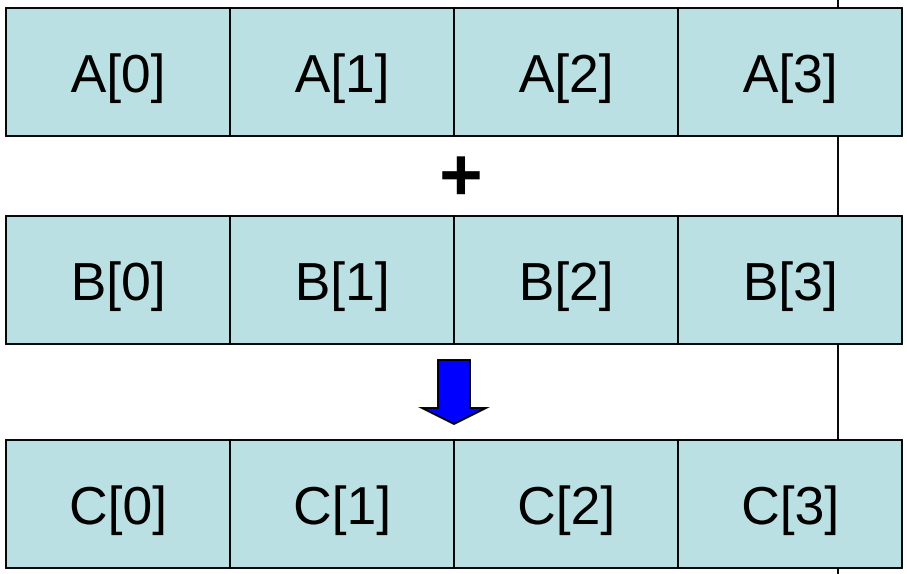
Homework #8 (4)

- 輸入檔檔名 data.txt (自行產生)
  - 包含200 row的資料
  - 每一row有200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;
}
```

先对齐



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 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/#

Homework #8 (5)

- 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 (6)

- 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、**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: hw9.c
  - A C program with SIMD intrinsic functions: hw9simd.c
  - Any file needed in your work (ex: Makefile)
- **Deadline: January 12, 24:00, 2019**

這時間之後，將無法補交這次作業