



二維陣列

2D Array

Warm-up Exercise

- 寫一支程式讀取學生的成績，並輸出成一張表格
- 假設有四位同學，每位同學有三個成績

Input

```
100 90 80
90 88 77
88 55 100
93 93 93
```

Output

```
Student 1: 100 90 80
Student 2: 90 88 77
Student 3: 88 *55 100
Student 4: 93 93 93
```

Warm-up Exercise

```
1  #include <iostream>
2  using namespace std;
3
4  int main(){
5      constexpr int NumScores=3;
6      int stu1[NumScores],stu2[NumScores],
7          stu3[NumScores],stu4[NumScores];
8      for(int i=0;i<NumScores;i++){
9          cin>>stu1[i];
10     }
11     for(int i=0;i<NumScores;i++){
12         cin>>stu2[i];
13     }
14     for(int i=0;i<NumScores;i++){
15         cin>>stu3[i];
16     }
17     for(int i=0;i<NumScores;i++){
18         cin>>stu4[i];
19     }
20     return 0;
21 }
```

如果人數改變，或分數變多了...?

超累der

Warm-up Exercise

修改人數或分數數量容易！

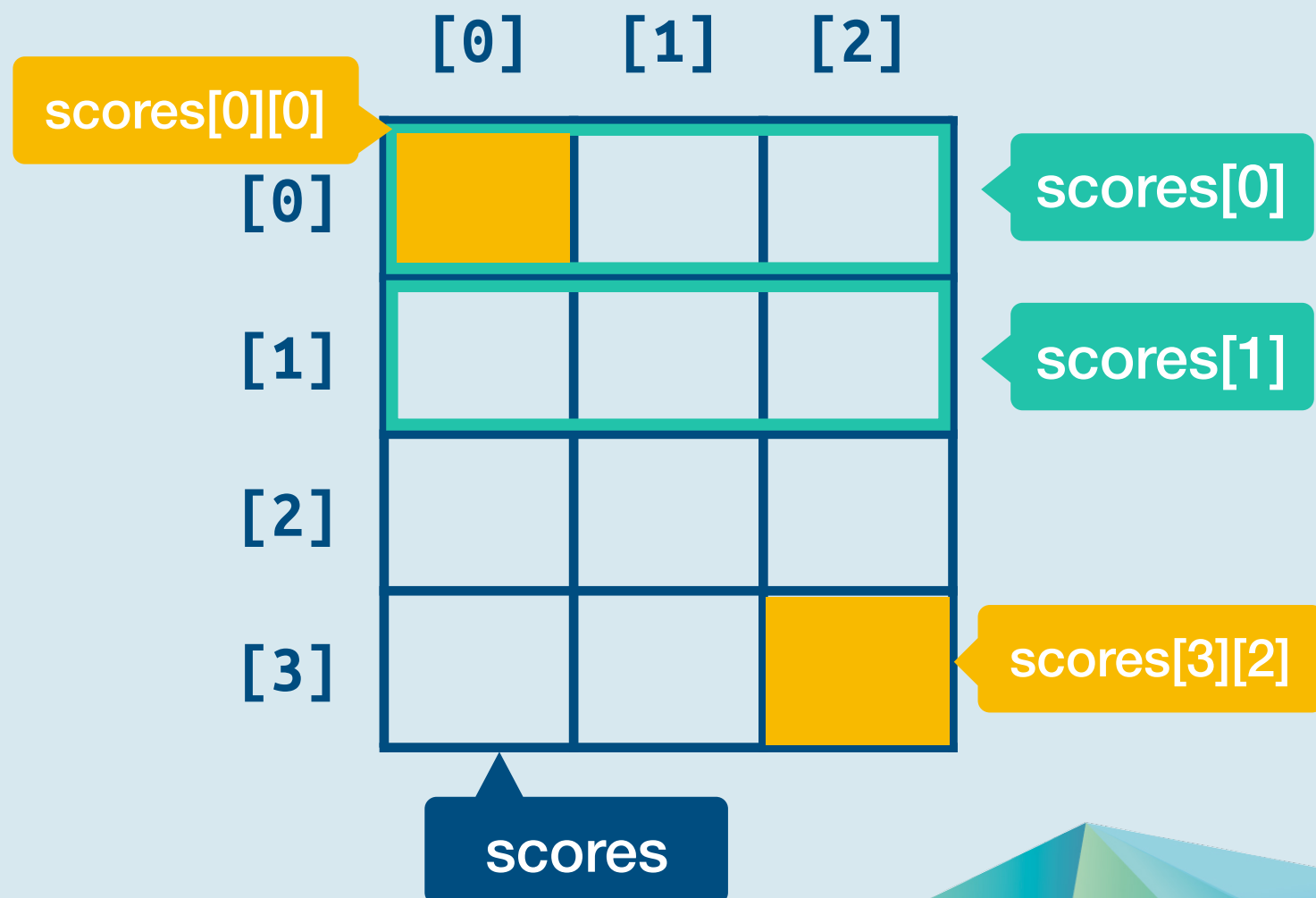
```
4  int main(){
5      constexpr int NumStudents=4, NumScores=3,
6      TotalNumScores=NumStudents*NumScores;
7      int scores[TotalNumScores];
8      for(int i=0;i<NumStudents;i++){
9          for(int j=0;j<NumScores;j++){
10             cin>>scores[i*NumScores+j];
11         }
12     }
13     for(int i=0;i<NumStudents;i++){
14         for(int j=0;j<NumScores;j++){
15             cout<<scores[i*NumScores+j]<<" ";
16         }
17         cout<<endl;
18     }
19     return 0;
20 }
```

很容易不小心寫錯

二維陣列

- scores是4個可以儲存3個整數的陣列

```
int scores[4][3];
```



二維陣列初始化

```
int data[4][3] = {{1, 2, 3}, {4, 5}, {6}};
```

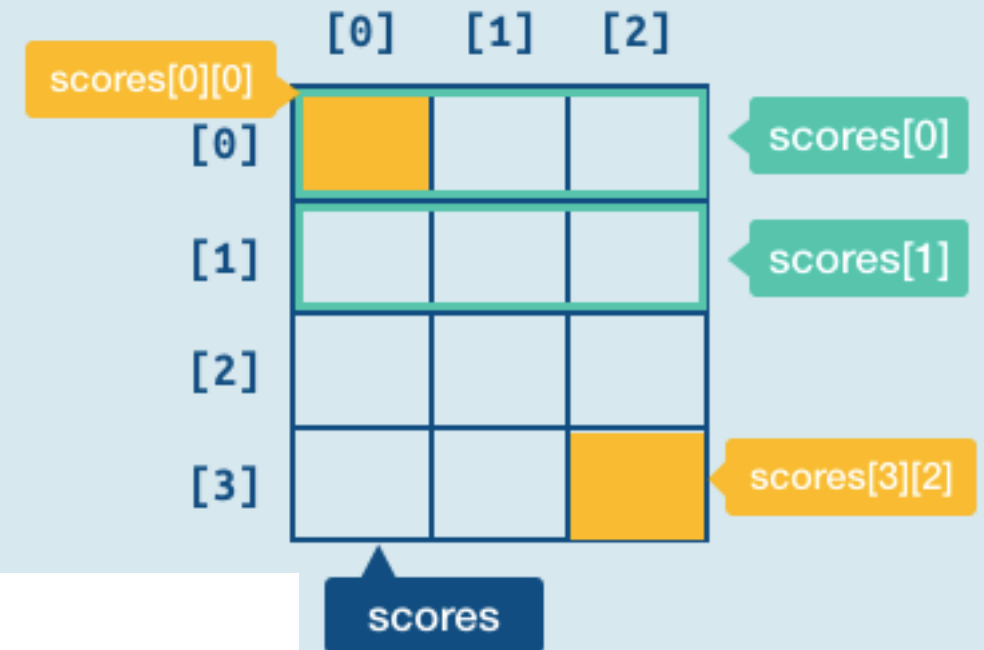
	[0]	[1]	[2]
[0]	1	2	3
[1]	4	5	0
[2]	6	0	0
[3]	0	0	0

概念上長這樣...

1	2	3	4	5	0	6	0	0	0	0	0
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實際上電腦是這樣儲存的！

二維陣列存取



```
4 int main(){
5     int scores[4][3];
6     //...
7     for(int stu=0;stu<4;stu++){
8         for(int sc=0;sc<3;sc++){
9             cout<<scores[stu][sc]<<" ";
10        }
11        cout<<endl;
12    }
13    return 0;
14 }
```


Exercise 成績表

- 使用二維陣列改寫程式

Output

Student 1:	100	90	80
Student 2:	90	88	77
Student 3:	88	*55	100
Student 4:	93	93	93

Exercise 成績表

```
1  #include <iostream>
2  #include <iomanip>
3  using namespace std;
4
5  int main(){
6      constexpr int NumStudents=4, NumScores=3;
7      int scores[NumStudents][NumScores]={};
8      for(int i=0;i<NumStudents;i++){
9          for(int j=0;j<NumScores;j++){
10             cin>>scores[i][j];
11         }
12     }
13     for(int i=0;i<NumStudents;i++){
14         cout<<"Student "<<i+1<<": ";
15         for(int j=0;j<NumScores;j++){
16             if(scores[i][j]<60){
17                 cout<<"*"<<setw(2)<<scores[i][j]<<" ";
18             }
19             else{
20                 cout<<setw(3)<<scores[i][j]<<" ";
21             }
22         }
23         cout<<endl;
24     }
25     return 0;
26 }
```



多維陣列

Multidimensional Array

三維陣列

