

**Students:**

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## 12.6 Practice Challenge Q6 (10 marks)

In this exercise you should implement a C++ function to multiply two matrices as detailed below. You are provided with the following files:

- `main.cpp` - provided for you to use while you develop your code. This will not be used to test your code.
- `matrix.h` - a read only header file
- `matrix.cpp` - you will write your assessed C++ code here

**Function**

Implement the following function:

```
std::vector<std::vector<int>> multiplyMatrices(  
    std::vector<std::vector<int>>& mat1,  
    std::vector<std::vector<int>>& mat2  
) ;
```

The details of the function are:

- the function takes two matrices as input, represented using 2D vectors
- the function performs the multiplication operation.
  - To multiply the two matrices `mat1` and `mat2`, you perform a series of dot products between rows of `mat1` and columns of `mat2`. The resulting matrix will have dimensions  $M * N$ , where  $M$  is the number of rows in `mat1` and  $N$  is the number of columns `mat2` (see the example below)
- the function stores the resulting matrix in a new 2D vector
- the function returns the resulting vector

**Example**

For the following matrices (2D vectors) and function call:

```
std::vector<std::vector<int>> mat1 = {{1, 2, 3}, {4, 5, 6}};  
std::vector<std::vector<int>> mat2 = {{7, 8}, {9, 10}, {11, 12}};  
std::vector<std::vector<int>> result = multiplyMatrices(mat1,  
mat2);
```

The function will return the following result matrix (2D vector):

```
{{58, 64}, {139, 154}}
```

which is the result of these calculations:

```
{{(1*7 + 2*9 + 3*11), (1*8 + 2*10 + 3*12)},  
{(4*7 + 5*9 + 6*11), (4*8 + 5*10 + 6*12)}}
```

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**LAB  
ACTIVITY**

12.6.1: Practice Challenge Q6 (10 marks)

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Current file: **main.cpp** ▾[Load default template...](#)

```
1 #include <iostream>
2 #include "matrix.h"
3
4 int main() {
5
6     // *****
7     // * This code is provided as a starting point for development and tes
8     // * Please modify the code below as you develop your program.
9     // * It will NOT BE USED to test your code
10    // * *****
11
12    std::vector<std::vector<int>> mat1 = {{1, 2, 3}, {4, 5, 6}};
13    std::vector<std::vector<int>> mat2 = {{7, 8}, {9, 10}, {11, 12}};
14    std::vector<std::vector<int>> result = multiplyMatrices(mat1, mat2);
15
16    std::cout << "Resulting matrix:" << std::endl;
17    for (const auto& row : result) {
18        for (int elem : row) {
```

**Develop mode****Submit mode**

Run your program as often as you'd like, before submitting for grading. Below, type any needed input values in the first box, then click **Run program** and observe the program's output in the second box.

Enter program input (optional)

If your code requires input values, provide them here.

**Run program**

Input (from above) →

**main.cpp**  
(Your program)

Program output displayed here

Coding trail of your work [What is this?](#)

History of your effort will appear here once you begin working on this zyLab.

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