PIC 10A 1C. Week 8a Exercises. TA: Eric Kim. [Solutions]

1. I Know Kung-Fu...

Write a program that does the following:

(1) Asks the user for the number of desired rows and columns of the matrix.

(2) Randomly generate a matrix of ints of the desired size. Each entry should be an integer ranging from 1 to 6, inclusive.

(3) Displays each entry of the matrix in the following style:

1 4 2 5
3 4 6 1
5 4 2 3

Example Output:

```
Number of rows? 3
Number of cols? 4
1 4 2 5
3 4 6 1
5 4 2 3
```

```
// YOUR CODE HERE. Use the vector class. Try using a nested for-loop too.
```

[Solution]

```
#include <iostream>
#include <vector>
#include <cstdlib> // rand
using namespace std;
int main() {
    int n, m;
    cout << "Number of rows? ";
    cin >> n;
    cout << "Number of cols? ";
    cin >> m;
    vector< vector<int> > M(n, vector<int>(m, 0));
    /* Initialize matrix values: [1,6] */
    for (int i = 0; i < n; ++i) {
        for (int j = 0; j < m; ++j) {
            M[i][j] = (rand() % 6)+1;
        }
    }
    /* Make matrix look pretty */
    for (int i = 0; i < n; ++i) {
        for (int j = 0; j < m; ++j) {
            cout << M[i][j] << " ";
        }
        cout << endl;
    }
```

```
    return 0;
}
```

2. Evenly odd, or oddly even?

Write a program that generates 500 random integers, and outputs the percentage that are even. Format the output so that the percentage is in fixed-point notation, with at most 2 decimal points. This is a quick test to see if there is some bias in rand()'s PRNG algorithm. For reproducibility, set the PRNG seed to: 42.

Expected Output:

```
    Percentage of even: 45.60%
// YOUR CODE HERE
```

[Solution]

```
#include <iostream>
#include <cstdlib> // rand, srand
#include <iomanip>
using namespace std;
int main() {
    unsigned int nbevens = 0;
    const int N = 500;
    srand(42);
    for (int i = 0; i < N; ++i) {
        int r = rand();
        if ((r % 2) == 0)
            nbevens += 1;
    }
    double frac = static_cast<double>(nbevens) / N;
    cout << "Percentage of even: ";
    cout << fixed << setprecision(2) << 100.0*frac << "%" << endl;
    return 0;
}
```

3. Magnitude: Pop-pop!

After each code snippet, what are the contents of the vector? If a crash occurs, explain why. The first has been done for you.

Code	**Vector Contents**
`vector<int> v0 = {1, 2};` `v0.push_back(3);`	`[1, 2, 3]`
`vector<int> v1(4);` `v1.pop_back();`	[0, 0, 0] int default-initializes to 0.
`vector<char> v2(3, 'a');`	['a', 'a', 'a']
`vector<int> v3 = {1, 2};`	[] (Empty)

`v3.pop_back(); v3.pop_back();`	
`vector<double> v4 = {};` `v4.pop_back();`	Runtime Error! Called pop_back() on an empty vector.
`vector<string> v5(2);` `v5[1] = "meow";`	["", "meow"] string default-initializes to empty string "".