- Exercises

Let's test our knowledge of copy and move semantics with these exercises.

WE'LL COVER THE FOLLOWING

Exercise 1

In the program below, a `BigArray` with 10 billion entries will be pushed to a `std::vector`.

Compile the program and measure its performance.

```
#include <algorithm>
#include <chrono>
#include <iostream>
#include <vector>

using std::cout;
using std::endl;

using std::chrono::system_clock;
using std::chrono::duration;

using std::vector;

class BigArray{

public:
  BigArray(size_t len): len_(len), data_(new int[len]){}

  BigArray(const BigArray& other): len_(other.len_), data_(new int[other.len_]){
    cout << "Copy construction of " << other.len_ << " elements "<< endl;
    std::copy(other.data_, other.data_ + len_, data_);
   }

  BigArray& operator = (const BigArray& other){
     cout << "Copy assignment of " << other.len_ << " elements "<< endl;
     if (this != &other){
        delete[] data_;
        len_ = other.len_;
        data_ = new int[len_];
        std::copy(other.data_, other.data_ + len_, data_);

     }
     return *this;
  }

  ~BigArray(){
     if (data_ != nullptr) delete[] data_;
  }

private:
  size_t len_;
  int* data_;
};

int main(){

  cout << endl;

  vector<BigArray> myVec;

  auto begin = system_clock::now();

  myVec.push_back(BigArray(1000000000));

  auto end = system_clock::now() - begin;
  auto timeInSeconds = duration<double>(end).count();

  cout << endl;
  cout << "time in seconds: " << timeInSeconds << endl;
  cout << endl;

}
```

Exercise 2

Extend `BigArray` with the move semantic and measure the performance once more. How big is the performance gain?

```
#include <algorithm>
#include <chrono>
#include <iostream>
#include <vector>

int main() {
  // your code goes here
}
```

The solution to Exercise 2 can be found in the next lesson.