Review

C++ in QF I - a course by Paweł Sakowski

Przemysław Kurek

Chair of Political Economy
Faculty of Economic Sciences
University of Warsaw

Labs 07

Special event III:

- Solving excercises 7-14 grants $+2$ points at the exam and home taken project (4 in total).
- Deadline: 22nd December 2020, 23:59.
- Send me `.zip` file with all the solutions by email. Title email with exact letters "SE3_CPP". Remember to put in the email your full name and student ID.

Exercises I

1. What is the value of i and num after running the following code? How many times will the loop iterate?

```
int i = 0;
int num = 1;
while (i < 16){
  i = num;
  num = 2 * num;
}
```

Exercises II

2. Convert the following for loop to a while loop.

```
for(i = 0; i < num; i++){
  cout << i << "Enter a value: ";
  cin  >> val;
  cout << " \nYou entered " << val << "\n";
}
```

Exercises III

3. Use a for loop to calculate the sum of all numbers between (and including) two integers entered at the keyboard. For example, if the numbers 4 and 9 are entered, the result will be
$4 + 5 + 6 + 7 + 8 + 9 = 39$.
Declare and initialize variables as needed, and output the sum after the loop terminates.

Exercises IV

4. Write a function that takes one character as input and prints out that character plus the next five characters, separated by spaces. The function takes one char argument, and returns a char. For example, if the value of the argument passed to the function was m, then the function would print: m n o p q r and return r.

5. Write a function named abs_val that returns the absolute value of an int passed to it by value. Do not use any special library functions.

Exercises V

6. Write a complete program to display the following format.

A
AB
ABC
ABCD
ABCDE
ABCDEF
ABCDEFG
ABCDEFGH
ABCDEFGHI
ABCDEFGHIJ
ABCDEFGHIJK

Hint: you need to use loop structure. The ASCII code for A is 65.

Exercises VI

7. Write a class for an annuity that includes:
   - information about constant amount paid,
   - lenght in years,
   - frequency of payments per annum,
   - constant discount rate
   - method for present value if annuity-immediate (payments paid at the end of each period)
   - method for present value if annuity-due (payments paid at the beginning of each period)
   - method for future value if annuity-immediate (payments paid at the end of each period)
   - method for future value if annuity-due (payments paid at the beginning of each period)

8. As above, but derive subclasses for each of two types of annuities, with their own methods for calculating both present value and future value.

Exercises VII

⑨ We consider a following structure

```
struct box{
    char producer[40];
    float height;
    float width;
    float length;
    float volume;
}
```

- Write a function which will accept the structure box as argument (passed by value), and which will print out values of all elements.
- Write a function which will accept address of the structure box, and which will set the value of volume as a product of ist three edges.
- As in 9) but structure should be passed by reference.
- Write a program with implementation of functions above.

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10 Write a function which takes as arguments: 1) array, 2) two doubles (expected value, and standard deviation). The function should fill the array with daily returns that come from normal distribution with given parameters. Input array should be passed by its address using a pointer. Hint: to generate realizations of $N(0, 1)$ you can use the following function

```
double GetOneGaussianByBoxMuller(){
  double result, x, y, SizeSquared;

do {
  x = 2.0*rand()/static_cast<double>(RAND_MAX)-1;
  y = 2.0*rand()/static_cast<double>(RAND_MAX)-1;
  sizeSquared = x*x + y*y;
} while (sizeSquared >= 1.0);

result = x*sqrt(-2*log(sizeSquared)/sizeSquared);
return result;
}
```

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Exercises IX

11. Write a function that will take as argument an array from Exercise 10 and return its average value.

12. Write a function that will take as argument an array from Exercise 10 and return its standard deviation.

13. Write a function that will take as argument an array from Exercise 10 and return another array which contains realization of a random walk process with increments from the input array.

14. Write a function that will take as argument an array from Exercise 13 and return a) max and b) min element from the input array.

Thank you!