Professional Software Engineering

Homework exercises

This document contains a few homework exercises that you can use to practice some of the concepts that were presented during the last lecture. These homework exercises are not mandatory, but are really helpful if you do not have any coding experience. We will upload the solutions of these exercises on Monday and if you have any any doubts or problems you can let us know during the next class or post your doubt on the moodle forum.

1 Guess the Password

Create a program that takes a user input (as a string) and compares it to a password you have set. Only exit the program if the user's input matches the password.

Before exiting print out that the guess was correct (and print that the guess was wrong for wrong answers).

Hint: Use a conditional loop to keep asking the user for input until they guess the correct answer. Use if statements to check if the answer is correct.

2 Prime Number

Write a C# program which takes a natural number as an input from the Console and returns whether it is prime or not.
Note: Prime number is a natural number which has only two factors: 1 and itself.

Examples:

- 13 = 1 x 13 – Prime

- 22 = 1 x 2 x 11 - Non-prime/composite

- 1 - neither prime nor composite. So your output should be non-prime.

Hint: Use conditional loops (while/do-while loops).

3 Tax Computation

Given below are the income tax percentages and their corresponding salary limits (e.g. for salaries under 10K the income percentage tax is 0%). Create a program that uses the salary limits and tax percentages to calculate the income tax (given a user's salary).

Use arrays to store the tax percentages and salary limits, as well as 5 random salaries (you do not need to accept a user's input in this exercise). Loop through the salaries and calculate each salary's income tax (formulae provided below). Store the result in an array. Print the the calculated income tax for each salary to the console.

Hint: Loop through the salaries (for loop) and check each salary against the salary limits (use if statements). Don't forget to create an empty array outside the loop to store the result.
Note: We will create an improved version of this exercise in one of the upcoming classes.

Salary Limits (Thousands)	Tax Percentages(%)
10	0
60	25
280	42
>280	45

For each salary:

- The first 10.000 is non-taxable

- 50.000 of the total is taxed at 25%

- 220.000 of the total is taxed at 42%

- The rest is taxed at 45%

4 Guess the Number

Create a program that takes a integer guess from the user and compares it to a "secret number" you set in your program. The secret number should be set within a lower and higher bound that you print to the user in the beginning of the program (e.g. Guess a number between 5 and 10.).

Tell the user whether their guess was higher or lower than the secret number. Exit the program once the user guesses the number correctly (in that case, print out to the console that the answer was correct).

Hint: This is a very similar exercise to GuessThePassword. Keep in mind however, that you need to cast/convert the user's input to an integer.

5 Bonus Task: Selection Sort

Write a C# program to sort an input array in ascending order using Selection sort algorithm and print the sorted array to console.
You can define an input array in the program itself, i.e. input from console isn't required.

The selection sort algorithm can be summarized as follows.

1. You take the value at first index, compare it with values present to the right of it in array and find the minimum value.

2. Once the minimum value is found, a swap is done between the minimum value and value stored at the current index.

3. The index is then incremented and the process is repeated until entire array is sorted.

Examples:
Input array: [4, 1, 2, 5, 3]
After Pass 1: [1, 4, 2, 5, 3]
After Pass 2: [1, 2, 4, 5, 3]
After Pass 3: [1, 2, 3, 5, 4]
Final Pass: [1, 2, 3, 4, 5]

Further reading: https://en.wikipedia.org/wiki/Selection_sort