

BIL 214 – System Programming

Homework #2

Assigned on 27.09.2022 – Due on 04.10.2022

- Submit one C source file per question.
- If a source file fails to compile with the gcc compiler, you get zero credits for that question.
- Make sure your submission file names are formatted as:

FirstName_LastName_StudentID_HW#_Q#.c

For example: **Toygar_Akgun_123456789_HW2_Q1.c**
 Toygar_Akgun_123456789_HW2_Q2.c
 Toygar_Akgun_123456789_HW2_Q3.c ...

1. [10 points] A prime number is any natural number greater than 1 that is divisible only by 1 and by itself. Write a C program that reads an integer and determines whether it is a prime number or not. Assume that the input integer is less than 100.
2. [10 points] Write a program to calculate and print a list of all prime numbers from 1 to 100.
3. [10 points] Write a C program that reads an integer and determines whether it is a prime number or not. Assume that the input integer is bigger than 100000.
4. [10 points] Floyd's Triangle is a right-angled triangular array of natural numbers. It is defined by filling rows with consecutive integers. Thus, row 1 will have the number 1, row 2 will have the numbers 2 and 3, and so on. Write a program that draws a 10-line Floyd's triangle. An outer loop can control the number of lines to be printed and an inner loop can ensure that each row contains the correct number of integers.
5. [20 points] The factorial of a nonnegative integer n is written $n!$ (pronounced "n factorial") and is defined as follows: $n! = n \cdot (n - 1) \cdot (n - 2) \cdot \dots \cdot 1$ (for values of n greater than or equal to 1) and $n! = 1$ (for $n = 0$). For example, $5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$, which is 120.
 - a) Write a program that reads a nonnegative integer and computes and prints its factorial.
 - b) Write a program that estimates the value of the mathematical constant e by using the formula:
$$e = 1 + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \dots$$
 - c) Write a program that computes the value of e^x by using the formula:
$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$$
 - d) Write a program that will compute and print the maximum number that you can correctly compute the factorial of.
6. [10 points] Create a float variable with the value 1000000.00. Next add to that variable the literal float value 0.12f. Display the result using printf and the conversion specifier "%.2f".

7. [20 points] Write a C program that plays the game of “guess the number” as follows: Your program chooses the number to be guessed by selecting an integer at random in the range 1 to 1000. The program then types:

```
I have a number between 1 and 1000.  
Can you guess my number?  
Please type your first guess.
```

The player then types a first guess. The program responds with one of the following:

```
1. Excellent! You guessed the number!  
   Would you like to play again (y or n)?  
2. Too low. Try again.  
3. Too high. Try again.
```

If the player’s guess is incorrect, your program should loop until the player finally gets the number right. Your program should keep telling the player “Too high” or “Too low” to help the player “zero in” on the correct answer. [Note: The searching technique employed in this problem is called binary search.]

8. [10 points] Write a function that takes an integer and returns the sum of its digits. For example, given the number 7631, the function should return 17. Assume that the input is smaller than 9999999.