

Introduction to Computer Science, Winter Semester 2018
Practice Assignment 4

Discussion: 27.10.2018 - 1.11.2018

Exercise 4-1 Mystery 1

Given the following iterative algorithm:

```
n = eval(input())
previous = -1
result = 1
i = 0

while i <= n:
    _ sum = result + previous
    _ previous = result
    _ result = sum
    _ i = i + 1
print("The fibonacci value is ")
print(result)
```

Trace the algorithm for $n = 6$

Exercise 4-2 Power By Multiply

Write an algorithm that gets two positive integer numbers X and Y and calculates X^Y . Use only the addition and the multiplication.

Exercise 4-3 Mystery 2
 To be discussed in Tutorial

- Trace the following iterative algorithm for $\text{num1} = 987$, $\text{num1} = 64$, $\text{num1} = -1$:

```
num1 = eval(input())
count = 0
num2 = num1

while ( num1 != -1):
    _ if(num1 == 0):
    _ _ count = 1
    _ if(num2 != 0):
    _ _ count += 1
    _ _ num2 = num2 // 10
    _ else:
    _ _ print(count)
    _ _ count = 0
    _ _ num1 = eval(input())
    _ _ num2 = num1

print("you entered -1")
```

- What is the functionality of this algorithm? i.e What does this algorithm do.

Exercise 4-4 Calculate series

Write an algorithm that given n calculates and displays the value of the following series

$$1^2 + 2^2 + 3^2 + \dots + n^2$$

Exercise 4-5 Find series

Write an algorithm to find the least number of terms that must be added to the following series

$$1^2 + 2^2 + 3^2 + 4^2 + \dots$$

to give a sum ≥ 10000

Exercise 4-6 Get The GCD
To be solved in Lab

The Euclidean algorithm determines the greatest common divisor (GCD) of two positive numbers by repeatedly replacing the larger number with the result of subtracting the smaller one from it until the two numbers are equal.

Write an algorithm for the Euclidean algorithm.

Exercise 4-7 Sum of Even Digits
To Be solved in Lab

Write an algorithm that sums up the even digits in a given number.

Exercise 4-8 How Many Year Must You Wait

A bank is offering an annual compound interest of 5%. Write an algorithm that tells you how many years you need to wait in order to reach a balance of y dollars, given your current balance.

As an Example

if your balance is 10 000, and your target is 20 000 you will wait 15 years

Exercise 4-9 Roll two dices
To be discussed in Tutorial

Write an algorithm that keeps on rolling two dices till both dices are equal

Exercise 4-10 Guess The Secret Number
To be discussed in Tutorial

This guessing game is a game where the program selects a random number between 1 and 10 and keeps asking you to guess, if you get it wrong you get a message informing you that you are a bad guesser, and then it asks you to guess again, if you guess right your program congratulates your player and exits the game loop.

As an example assuming the program picked 6 as the secret number:

The program prints **Guess the right number:**
You enter **3**

The program prints **You guessed wrong XD**
You enter **6**
The program prints **You did it the correct number is 6**

Exercise 4-11 Prime Number
To be discussed in Tutorial

Write an algorithm that given an integer number determines whether the number is a prime number. A prime number is a number that can only be divided by itself and 1. For example, 11 is a prime number because it can be only divided by 1 and 11. However, 8 is not a prime number since it can be divided by 1, 2, 4 and 8.

Exercise 4-12 Perfect Number
To be solved in Lab

A perfect integer is a positive integer that is equal to the sum of all of its proper divisors. A proper divisor of an integer n is an integer between 1 (inclusive) and n (exclusive) that divides n with no remainder. For example, 6 is a perfect number because $6 = 1 + 2 + 3$.

Write an algorithm that decides whether an integer is a perfect number.

Exercise 4-13 Reverse Number

Write an algorithm that given an integer number, outputs the reverse of this number.

Exercise 4-14 Mirror

Write an algorithm that given two integer numbers, checks whether one number is a mirror of the other number. **Hint: Use the reverse algorithm that you implemented in the previous question.**

Fun fact: In the Computer Science world, we call the concatenation of both numbers a Palindrome.