



## Exercise Sheet 03

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Due: [November 26, 2024](#)

Please upload your solutions to WueCampus as a scanned document (image format or pdf), a typesetted PDF document, and/or as a jupyter notebook.

### 1. Understanding Python Code

For each of the following Python functions, describe what the algorithm does and how it works and provide the output for the given inputs.

```
(a) def function1(a):  
    result = 0  
    for x in a:  
        if x % 2 == 0:  
            result += x  
    return result
```

What is the result of

```
function1([1, 2, 3, 4, 5, 6, 7, 8, 9, 10])
```

```
(b) def function2(arr):  
    n = len(arr)  
    for i in range(n):  
        for j in range(0, n-i-1):  
            if arr[j] > arr[j+1]:  
                arr[j], arr[j+1] = arr[j+1], arr[j]  
    return arr
```

What is the result of

```
function2([64, 34, 25, 12, 22, 11, 90])
```

```
(c) def function3(n):  
    if n <= 1:  
        return False  
    for i in range(2, n):  
        if n % i == 0:  
            return False  
    return True
```

What is the result for the following inputs:

```
function3(29)
function3(14)
function3(1)
```

## 2. Writing Python Code

Write python functions, that solve the following problems.

- (a) The Fibonacci sequence is a famous sequence in mathematics. It starts with the numbers 0 and 1, and each subsequent number is the sum of the previous two numbers in the sequence. The sequence looks like this:

0,1,1,2,3,5,8,13,21,34,...

Write a Python function to calculate the  $n$ -th Fibonacci number. The function should take an integer  $n$  as input and return the  $n$ -th Fibonacci number.

- (b) Write a Python function called `fizz_buzz( $n$ )` that prints the numbers from 1 to  $n$ . However, for multiples of 3, print "Fizz" instead of the number, and for multiples of 5, print "Buzz". For numbers which are multiples of both 3 and 5, print "FizzBuzz".

What is the output of `fizz_buzz(15)`?

- (c) Write a Python function called `factorial( $n$ )` that calculates the factorial of a number  $n$ . The factorial of a number  $n$ , denoted as  $n!$ , is the product of all positive integers less than or equal to  $n$ . For example:

$$5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$$

$$0! = 1 \quad (\text{by definition})$$