

# Functional Programming

## USING HASKELL

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Bruno Dias da Gião

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## 1 INTRODUCTION

- Introductory Questions
- Installing Haskell via the Glasgow Haskell Compiler

## 2 FUNCTIONS

- What are function?
- Functions as a Contract
- Types
- From Input to Output
- Inside the Black Box

# Introduction

- ① What is Functional Programming?
- ② Why is it useful?
- ③ When do we get to C or Python or Java?

- 1 Installing chocolatey You will need to come to this link:  
<https://chocolatey.org/install#individual> and follow the instructions for “Individual use”
- 2 Installing cabal and ghc Run Powershell in admin mode and run the following commands

```
choco install ghc
```

```
choco install cabal
```

# Functions

# We still don't know what exactly is a function...

In that case let's try to define it in a very broad way... as a contract  
What does that mean? It means a function is something that receives something and gives us something  
But, what are those... "Somethings"?

## 1 Input/Arguments to a Function

### DEFINITION (INPUT)

An input is something that we pass to the function.

For example, ingredients are the input of the function that bakes a cake.

## 2 Output of a Function

### DEFINITION (OUTPUT)

The output of a function is what the function gives us back.

In the cake example, the cake itself is the output!



# What exactly binds the definitions of Input and Output?

Before we get to that let's do some exercises

## DEFINITION (TYPE)

A type is a Set whose's elements can be inserted into a function or be received from a function. Every function has a set of types for input and output.

## EXAMPLE

In the function “bake a cake”, we would grab a set of ingredients, perform a series of instructions, and then we would receive one of the many cakes that can be made.

However, in this very same function, we cannot give it a cake, and expect anything, or give it ingredients and expect ingredients, the types don't match those of the function!

But what **are** those series of instruction?

During the exercises we managed to find an “effect” that removed unnecessary spaces from sentences and preserved the needed spaces.

# That **was** a function.

## DEFINITION (FUNCTION)

A function is the procedure that transform an input into an output.

## DEFINITION (DEFINING A FUNCTION)

Thus we can define a function as such:

$$\text{name\_of\_function input} = \text{output}$$

Where the output is achieved via **Composition**

## DEFINITION (COMPOSITION)

Let  $f$  and  $g$  be two functions. We say they are composed when the output of one of them is fed into the other as input.

$$f \circ g = f(g(x)) \quad (1)$$

In other words,  $g$  receives  $x$  as an input and  $f$  receives the result of  $g(x)$  as the input.

## COROLLARY

*The composition of two functions (if correctly defined), is itself a function.*

## EXAMPLE

One of the exercises we did involved on such composition:

unwords (words sentence)

is an example of the composition of functions.