Functions

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Agenda

- Recap
- Functions
- First project
- If
- Case
- Microslop
- Formatter & clean code
- Homework

Recap

Course changes

- 1st Partial = 30%
  - Class exercise / Homework = 10%
  - Theorical evaluation - Functional paradigm = 20%
  - Theorical evaluation - HTML = 20%
  - Practical evaluation - Functional paradigm (paper based, NO computer!) = 25%
  - Practical evaluation - HTML (paper based, NO computer!) = 25%
- 2nd Partial = 30%
  - Class exercise / Homework = 10%
  - Theorical evaluation = 40%
  - Practical evaluation (maybe in computer) = 50%
- 3rd Partial = 40%
  - Theorical evaluation - Client-Server = 30%
  - Theorical evaluation - side effects = 30%
  - Practical evaluation (in computer) = 40%

Recap

- What is an expression?
- What is a value?
- What does this simbol means?

$\Rightarrow$

- Values are expressions?
- Expressions are values?
- What is imperative programming?
- What is state in computer science?
- Which primitive data types exist in elm?
- Exemplify 3 non-Int values
- Which conditions does the (+) operator has?

Functions

Variables

In elm we can create variables just by giving a name and binding a value:

```
myName = "Mitsiu"
```

Elm response is: Mitsiu : String

But let's look what happens if we try with a numerical value

Elm is unable to determine "age" type with certainty, it can be:

- A float that happens to have no decimal
- An integer

Data types & operators

Let's improve our communication hability remember that to say that an expression e has type t we write:

$$e : t$$

```
1 -- This is an inline comment, below is a type annotation
2 age : Int
3 age = 32
```

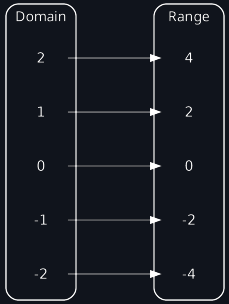
Line 1 is a type annotation it help's auto-document our code and clears all ambiguity about our true intent.

Functions

In math we find:

$$f(x) = 2 * x$$

- f is the name of the function
- f(x) the function f has an input x
- = 2 * x describe what the function does



Functions & Data types

Let's dig deeper into our function

$$f(x) = 2 * x$$

- f is the name of the function
- f(x) the function f has an input x
- = 2 * x describe what the function does

The typing rule for * is:

$$e1 * e2 : number \quad if \quad e1 : number \quad and \quad e2 : number$$

What can be inferred about the input and output of our function f?

Functions definition & Data types

$$f(x) = 2 * x$$

Let's start to code our first function in elm First our type annotation

```
1 -- Functions also have type annotations
2 f : number -> number
```

The function parameter has type number and the function returns a number

```
1 f : number -> number
2 f x =
3     -- This is the function body
4     2 * x
```

Function inputs and outputs

In the functional paradigm all functions must receive an input and return an expression

```
1 -- The function f receives a number and produces a number
2 f : number -> number
3 f x =
4     2 * x
```

Our type annotation describe:

- The function is called "f"
- Functions are values and they have a type ":"
- List of input types "number" separated by "->"
- The final type is the function output type "number"

Function application

To use the functions we just defined, we have to apply it.

1. We specify the function to apply by it's name
2. We have to provide a value for the input "x"

```
1 -- Function definition
2 f : number -> number
3 f x =
4     2 * x
5
6 -- Function application
7 f 4
```

So we would have that

$$f4 \Rightarrow 8$$

First project

First project

Let's create our first elm project.

1. Create a folder to store all our exercies and homeworks (for example C:\Documents\web)
2. In the previous folder create a new folder for todays exercise (Ex1-functions)
3. Open a terminal in that folder

```
pwd
cd C:\Documents\web\Ex1-functions
```

4. Once you are in the correct folder run the command:

```
elm init
# Accept the following questions
```

Elm init

`elm init` is the command to bootstrap an elm project, it creates:

1. The file "elm.json":
   - elm.json is the file describing all libraries required for our project to run.
2. The folder "src"
   - The folder to write our code

Coding

Let's create a file "Helper.elm" in the "src" folder.

```
-- File: Ex1-functions/src/Helper
module Helper exposing (..)

double : number -> number
double x =
    x * 2
```

Let's make sure our terminal is at "Ex1-functions" (pwd)

```
pwd
elm repl
```

REPL stands for Read Eval Print Loop

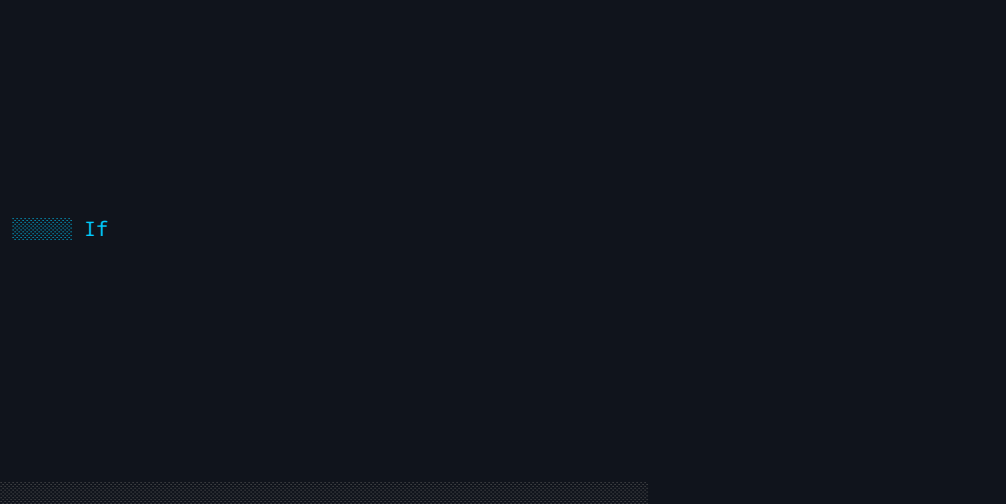
```
import Helper

Helper.double

Helper.double 4

:exit
```

More functions

1. A new function "square" that takes a number and square's it (x^2)

2. A new function called "Greet" so that it receives a String name and return "Hello " + name

3. A new function "above5 : number -> Bool" that evaluates if a given number is greater than (>) 5


If

If

The if expression has one of the following structures:

$$\begin{aligned}&\text{if } e1 : \text{Bool then}\\ &\quad e2 : \alpha\\ &\text{else}\\ &\quad e3 : \alpha\end{aligned}$$

$$\begin{aligned}&\text{if } e1 : \text{Bool then}\\ &\quad e2 : \alpha\\ &\text{else if } e3 : \text{Bool then}\\ &\quad e4 : \alpha\\ &\text{else}\\ &\quad e5 : \alpha\end{aligned}$$

Like all other expressions, an if expression returns a value of type alpha

In Elm we must provide the else branch.

More functions

1. A new function "ifBoolTranslate" that get's a Bool and return a String either "Positivo" or "Negativo"

2. A new function "ifNumberSign" that get's a number and return a string either "Positive", "Negative", "Neutral"


Case

Case expression

Another usefull structure are case expressions:

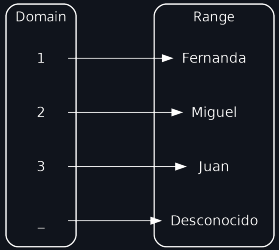
$$
\begin{aligned}
&\text{case}\ \ e1 : \alpha\ \text{of} \\
&\quad pat1 : \alpha\ \text{->} \\
&\qquad e2 : \beta \\
&\quad pat2 : \alpha\ \text{->} \\
&\qquad e3 : \beta
\end{aligned}
$$

Notice that all possible values of type alpha must be evaluated consider:

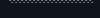
```
caseExample : Int -> Bool
caseExample num =
    case num of
        3 ->
            True

        _ ->
            False
```

More functions

1. A new function "getNameById" that get's an Int and return a String



2. A new function "getGradeByName" that get's a String and return a Float


Microslop

Microslop

Powershell script execution fix:

1. Open PowerShell with Run as Administrator.
2. Execute

```
Set-ExecutionPolicy -ExecutionPolicy RemoteSigned
```

3. Reopen your terminal

VsCode

1. File -> Preferences -> Settings
2. Search settings: "@lang:elm"
3. Editor: Format On Save


Formatter and clean code

▒▒▒▒▒ Formatter and clean code

Let's standarize how we write code:

```
# Check if our code complies the standarized elm rules:
elm-format src/ --validate
# Apply the format rules and modify our files:
elm-format src/
```

Check we provide all annotations:

```
elm-review \
--template jfmengels/elm-review-common/example \
--rules NoMissingTypeAnnotation,NoMissingTypeAnnotationInLetIn
```

Formatter and clean code

Verify our code compiles and is valid:

```
elm make src/*
```

Check unit testing if present:

```
elm-test
```

Homework

Homework

1. Create a github account with your "alumnos.upa.edu.mx" email