

INFOB3CC: Haskell refresh

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Introduction

Here are some exercises in Haskell, to ensure that you have a working Haskell programming environment and to refresh your memory on functional programming. Check the resources page for tutorials or ask your tutor if you have any questions.

- <https://ics-websites.science.uu.nl/docs/vakken/b3cc/resources.html>

Questions

1. Lists are perhaps the most common data type in Haskell. Elements of a list are comma separated and surrounded by square brackets [and], and all elements of the list must be of the same type. Lists can also be constructed and destructed using `:` (cons) and `[]` (nil). Are the following True or False?
 - (a) `"" == []`
 - (b) `'a' : "bc" == ['a', 'b', 'c']`
 - (c) `6 : "789" == "6789"`
2. Write a function `rev` that reverses a list. What is the complexity of your implementation?
3. In Haskell, set notation such as $\{x \mid x \in S \wedge p(x)\}$ can be written as a list comprehension as follows: `[x | x <- S, p x]`. Here, `<-` is pronounced *drawn from* and `p x` is called the *guard*. What is the output of the following?
 - (a) `[x + 5 | x <- [1,2,3]]`
 - (b) `[x | x <- [2..10], 10 `mod` x == 0]`
 - (c)

```
[ team ++ "␣" ++ player
  | team    <- ["red", "blue"]
  , player <- ["soldier", "pyro", "scout" ] ]
```
 - (d) `[(a,b,c) | c<-[1..10], b<-[1..c], a<-[1..b], a^2 + b^2 == c^2]`
4. Write a function `caesar :: Int -> String -> String` that implements a shift cipher, incrementing each letter of the input by the given number of places. The functions `ord` and `chr` from the module `Data.Char` may be useful.
 - https://en.wikipedia.org/wiki/Caesar_cipher
 - **HINT:** Start by writing a function `rotate :: Int -> Char -> Char`.
5. Write a binary tree data type where the information is stored in the leaves

```
data Tree a = ...
```

- (a) Write a function `toList :: Tree a -> [a]` returning a list of all of the information contained in the tree.
 - (b) Write a function `sumTree` which, given a `Tree` containing `Int` values, sums all the values in the tree.
6. Write a program which asks the user for input, and exits only when the user input is "y" or "yes".
7. Write a program to count the number of lines in a file.