# Homework 5 Lists in functional programming Answers

1. The list **fish = ["Cod", "Trout", "Hake", "Chub", "Pike", "Dab"]**

What is returned by these function calls?

(a) tail fish [1]

["Trout","Hake","Chub","Pike","Dab"]

(b) head (tail fish) [1]

“Trout”

(c) null (tail (tail( tail ( tail (tail (tail fish )))))) [1]

True

2. Write statements in Haskell to:

(a) prepend the numbers 5, 10 to the list **num1 = [15, 20, 25]**, storing the result   
in **num2**. [2]

num2 = [5,10] ++ num1

(b) append the numbers 30, 35, to the list **num2**, storing the result in **num3**. [2]

num3 = num2 ++ [30,35]

(c) Why is it not possible to append numbers to **num2**, leaving the result in **num2**? [1]

Lists in Haskell are immutable/cannot be changed

(d) What would be the result of concatenating the lists **num2** and **num3**? [1]

[5,10,15,20,25,5,10,15,20,25,30,35]

3. Readings from a sensor are stored in the list **humidity = [45, 67, 81, 73, 62, 41]**

What is returned by these function calls?

(a) map (+5) humidity [1]

[50, 72, 86, 78, 67, 46]

(b) filter (>70) humidity [1]

[81, 73]

(c) map (+10) (filter (>70) humidity) [2]

[91, 83]

4. In Haskell, strings of characters can be treated as lists. The following list contains 3 strings:

**sentence = ["Here", "we", "are"]**

(a) **length** is a function which returns the number of elements in a list.

(i) Write a statement which will return the number of strings in **sentence**. [1]

length (sentence) (Alternative: length sentence)

(ii) **map** is a function which takes a list and the function to be applied to the elements in the list, and returns a list made by applying the function to each element of the list.

Write a statement which will return a list containing the lengths of each   
word in the list **sentence** given above. [2]

map length (sentence) (Alternative: map length sentence)

(iii) What will be the list returned by this statement? [1]

[4,2,3]

(b) The **foldl** function reduces a list to a single value, so that

foldl (+) 10 [2,3,4,5] evaluates to 10 + 2 + 3 + 4 + 5 = 24

Write a statement using the **foldl, map** and **length** functions which will count   
all the characters in the list **sentence**. [3]

foldl (+) 0 (map length sentence)

Which should return 0 + 4 + 2 + 3 i.e. 9

[Total 20 Marks]