

159.202 Assignment 3-updated 26 Aug

Deadline:	Anytime before Saturday 12 Sept 2015, time: mid night
Evaluation:	10 marks – which is 3% of your final grade
Late Submission:	5% per hour (or fraction of hour) it is late
Team:	The assignment can be done individually or in pairs.
Purpose:	Practice with Haskell functions, guards and if statements

This assignment consists of four exercises and is meant to help you practice with writing Haskell functions. You are expected to submit a single file named a3.hs (use Notepad or WordPad to create it), consisting of

- a) All authors name(s) and ID(s) (as comments at the top of the file)
- b) **Definitions, including types and good comments**, for all functions require in the following exercises.

Exercise 1 (2 marks). Answers to this question should be written as comments.

Find out, using expressions entered at the GHCi or WinGHCi' prompt:

- a) the last eight digits of the number given by 3 to the power 234
- b) the number of digits of 600! (600 factorial)
- c) the value of (5 % 8- div 13 4, "FUN"++ "THOMAS", 1+5/7 == 12/7)
- d) the values of chr 100 and ord 'Q'

Exercise 2 (4 marks).

- Define a function to compute the sum: $\sum_{i=1}^{n} i^3$ using a) The formula: $\sum_{i=1}^{n} i^3 = [n(n+1)/2]^2$, call the function **sum2a**
 - b) Guards and recursion, call the function sum2b
 - c) Patterns and recursion, call the function sum2c
 - d) Which of the solutions above is the most run-time efficient?-Write your answer as a comment and explain in one sentence how you reached your conclusion.

Exercise 3 (2 marks).

a) Write a function f:: Char -> Int that converts a hexadecimal digit to its decimal value. Upper and lower case letters have the same value. For example,

For any character that is not a hexadecimal digit, f should display an error message.

b) Write a Haskell function, netEarning, to compute the income of a person in New Zealand in 2014-2015 after deducting the income tax. You will consider only the initial earning value and the corresponding IRD tax to be deducted as per table

1

¹ First type at the prompt :m DataChar (to access the Char module); the prompt will change from Prelude> to Prelude Data.Char>

presented in Figure 1; you should ignore other deductions like ACC levy, etc... For example netEarning 65238.00 is 52646.6

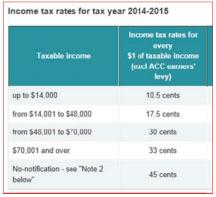


Figure 1. Income tax rates (from

http://www.ird.govt.nz/how-to/taxrates-codes/itaxsalaryandwage-incometaxrates.html)

Exercise 4 (2 marks).

a) Write a recursive function, **gcdD** to compute the gcd of two positive integers **using patterns or guards** and Dijkstar's algorithm.

```
Here is a C-program using Dijkstar algorithm:
int gcd(int x, int y) {
  if(x == y) {return x;}
  else if (x > y){return gcd(x-y, y);}
  else {return gcd(x, y-x);}
}
```

b) Write a recursive function $\mathbf{pow} \ \mathbf{n} \ \mathbf{k}$, to calculate the k-th power of n, using patterns or guards and the following algorithm:

```
If k is even, n^k = (n * n)^{k/2}
If k is odd, n^k = n*(n^{k-1})
```

If you have any questions about this assignment, please ask the lecturer before its due time!

Submit your solution electronically using 159.202 Stream.

Important:

- 1. You can define and use other functions in order to solve a problem that asks you to define a function to perform a specific task.
- 2. Use only the material covered in lectures or in Notes (Stream); solutions using material not covered in lectures or in the above mentioned Notes will get 0 marks.
- 3. The assignment can be done individually or in teams of at most 2 studentssend one solution file per team. All assignments authored by 3 or more students will get 0 marks.

- 4. Run your final version of *a3.hs* file on Albany computer labs and make sure it has no errors. **Please note that if we cannot run your a3.hs script you will get 0 marks.**
- 5. As sample solutions will be presented in lectures no extension will be possible.