

60-100 INDIVIDUAL ASSIGNMENT #2 (Fall 2014) (Hand in at Labs on **Thursday 25th September**) You must end your answer sheet with “I declare that this is my own work”, followed by your signature)

ANSWER the following questions 1 to 5 from CLASS TEST # 1 – 2006

1.1. Write Miranda programs to do the following:

- a) A program called p1 which outputs the list `[[1 , 2] , [2 , 3]]`
- b) A program called p2 **which uses p1** to output the list `[2 , 3]`

1.2. Write Miranda programs to do the following:

- a) A program called p3 which takes a list of numbers as input and outputs a list containing all of the numbers on the input cubed. **You must use the built-in map function** . An example of p3 is:

`p3 [3 , 5 , 2] => [27 , 125 , 8]`

- b) A program called p4 which takes a list of numbers as input and which outputs their sum. **You must use the built-in foldr function**. An example of executing p4 is:

`p4 [4 , 2 , 3] => 9`

1.3. Write Miranda programs to do the following:

- a) A program called p5 which takes two numbers as input and outputs the first number if it is greater than 0 and the second number otherwise. An example of executing p5 is:

`p5 (-3) 5 => 5`
`p5 7 9 => 7`

- b) A program called p6 which takes two lists as input and which outputs the list which has the largest first element. Examples of executing p6 are:

`p6 [3 , 5 , 2] [4 , 5] => [4 , 5]`
`p6 [9 , 4 , 12] [4 , 5] => [9 , 4 , 12]`

1.4. Write Miranda programs to do the following:

- a) **A recursive program** called p7 which takes a positive number `n` as input and returns True if the number is divisible by 3 and False otherwise. (Do NOT use the mod or rem functions). Examples of executing p7 are:

`p7 30 => True`
`p7 25 => False`

- b) **A recursive program** called p8 which takes a list and a number as input and which returns True if the number is in the list and False otherwise. For example:

`p8 [12 , 4 , 7] 4 => True`
`p8 [9 , 33 , 5] 6 => False`

1.5. Write Miranda programs to do the following:

- a) A program called p9 which takes a list of numbers as input and which returns the sum of their cubes. **You must use p3 and p4 and program composition** in your answer. An example of executing p9 is:

`p9 [4 , 2 , 3] => 99`

- b) A program called p10 which takes two list of numbers as input and which outputs a list of pairs (x, y) such that x comes from the first list, y comes from the second list and x is greater than y. **You must use a list comprehension in your answer**. An example of executing p10 i:

`p10 [3 , 6 , 18] [2 , 23 , 9 , 5] => [(6, 2), (6, 5), (18, 2), (18, 9), (18, 5)]`

SAMPLE ANSWERS TO INDIVIDUAL ASSIGNMENT #1 - 2014

```
p1 = 180
p2 = "your name"
p3 n = n * 2
|| or p3 = (*2) - double lines mean this is a comment

p4 x y = x, if x > y
      = y, otherwise ||note that the second '=' must be directly below or to the right of the = above

p5 = map (*2)

p6 [] = error "empty list"
p6 n = n!0

|| or p6 (x:xs) = x

p7 n = foldr (*) 1 n
|| or p7 = foldr (*) 1

p8 0 = 1
p8 n = n * p8 (n - 1)

p9 s t = s -- (s -- t)

p10 n = foldr (put_on_end) [] n
      where
        put_on_end x res = res ++ [x] || "where" allows you to define a new program locally (like a subroutine)

|| or p10 n = foldr (put_on_end) [] n
||       where
||       put_on_end x res = res ++ [x]

p11 0 = True
p11 1 = False
p11 n = p11 (n - 2)

|| or p11 0 = True
||    p11 n = ~(p11 (n - 1))

p12 n = (sumlist . map first) n
      where
        sumlist = foldr (+) 0
        first (a,b) = a

|| or p12 = (sumlist . map first)
||       where
||       sumlist = foldr (+) 0
||       first (a,b) = a
||
|| or p12 = foldr (+) 0 . map first
||       where first (a, b) = a
```