R computing for Business Data Analytics

Homework 1

Due date: October 13, 2014

Please e-mail your homework (.pdf) and the associated *R* code (.*R*) to hchuang.om@gmail.com.

The email title must be R_HW1_GroupName. NO late homework will be accepted.

Q1. (10%) Finish the following tasks using *R*.

(a) Create a vector called **downtime**. The vector should contain the following numbers: 0, 1, 2, 12, 12, 14, 18, 21, 21, 23, 24, 25, 28, 29, 30, 30, 30, 33, 36, 44, 45, 47, and 51.

(b) Calculate the mean, median, min, max, and range of **downtime**.

(c) Calculate the standard deviation, 5 percentile, and 95 percentile of downtime (Hint: Use the *quantile* function).

(d) What is the mode of **downtime** (Hint: Use the *table* function). What is the frequency?

(e) Pick out the subset of the mode numbers from the **downtime** vector.

P.S.: Show all the *R* functions that you use.

Q2. (10%) Use *rep*( ) and *seq*( ) as needed to create the two vectors.

(a) 0 0 0 0 0 1 1 1 1 1 2 2 2 2 2 3 3 3 3 3 4 4 4 4 4

(b) 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5

Q3. (5%)

(a) Create a 4x3 matrix that stores the values below. Also name each column correctly (x, y, z)

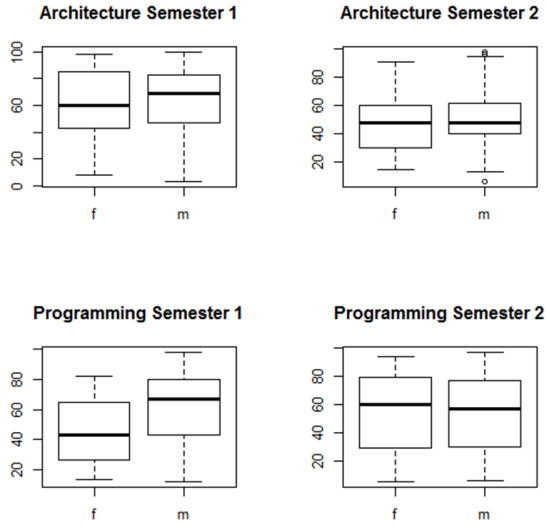
x	*y*	*z*
61	13	4
175	21	18
111	24	14
124	23	18

(b) Display the row 1, column 3 element of the matrix.

Q4. (10%) Calculate $\sum_{i=1}^{N} 1/i$, and compare with log(N)+0.6 for N = 500, 2000, 8000.

Q5. (10%) The equation $x^7+10000x^6+1.06x^5+10600x^4+0.0605x^3+605x^2+0.0005x+5$ has exactly one real root. Write an *R* program to find the root. What is the root? How many iterations of Newton's method are required to find this root if the initial guess is x=0?

Q6. (10%) Based on the *results.txt* file (in Lecture 1), write *R* code to reproduce the graph below.



Q7. (15%)

(a) Compute 4!, 50!, and 5000! (Hint: Use the *factorial* function)

(b) Compute $\binom{4}{2}, \binom{50}{20}$, and $\binom{5000}{2000}$

(c) The *factorial* function tends to return Infinity when its argument is large. To tackle this, apply *log*( ) and *sum*( ) to compute 5000! and $\binom{5000}{2000}$. Express your answers in terms of $e^?$.

Q8. (10%) The Fibonacci sequence is famous in mathematics. The sequence is defined as

$$F_1 = 1, F_2 = 1, F_n = F_{n-1} + F_{n-2} \text{ for } n > 2$$

(a) Write a *while*( ) loop to find the first Fibonacci number k > greater than 100.

(b) For the number F_n=k in (a), what is the index n?

(c) Write a *for*( ) loop to print **ALL** Fibonacci numbers <= k.

Q9. (10%) Write an *R* function that prints out all prime numbers <= n (where n is an integer). After writing the function, set n=100 and show me the results.

Q10. (10%) Consider the function $y=f(x)$ defined by $y = f(x) = \begin{cases} -x^3, \forall x \le 0 \\ x^2, \forall x \in (0,1] \\ \sqrt{x}, \forall x > 1 \end{cases}$.

Write an *R* function to calculate *y* using *if* statements.

Generate the following plot for *x*=seq(-2, 2, 0.1).