Introduction to Programming and Algorithms

Coursework 2 – Spring 2018

Instructions

About coursework 2

- This coursework (on Octave Programming) is worth **20%** of your IPA module mark.
- This assignment comprises 3 questions for a total of 50 marks.

Naming the files and submission

- Name the Octave function files as: **Mysign.m**, **Mynumber.m**, **Mymatrix.m** for questions 1, 2 and 3 respectively of this coursework.
- Copy+Paste all the above .m files into **ONE** separate text file.
  Name the file as: **StudentID.docx** e.g. 20030711.docx.
- Please submit your coursework together with a separate signed submission sheet electronically **via Dropbox on Moodle** (under heading: Coursework 2 – Programming)**.** Note that your work will not be returned so you should keep a copy for reference.
- The deadline for the submission of this coursework assignment is:
  Friday, 11th May 2018 (by 3 pm).

Information about marking

- Your functions may use recursion or iteration.
- Your functions should include comments (preceded by) where this will aid reader's understanding. However, there is no need to include a comment for every line of code.
- More marks will be gained for elegant and reasonably efficient solutions than for long and tedious ones.

Caution

- If you create functions on your own computer it is your responsibility to ensure that they perform correctly on the UNNC system. You will lose marks for functions that will NOT run properly on UNNC computers; regardless of how they will perform on your own computer.
- You are strongly advised to test your functions before submitting this assignment!
- **This work must be completed on your own. Plagiarism and collusion are regarded as very serious offences and will be treated as such.**

  Information on Academic Misconduct Policy and Procedure can be obtained at:

  http://www.nottingham.ac.uk/academicservices/qualitymanual/assessment/academic-misconduct.aspx

Question 1 (Chinese zodiac signs)

The Chinese zodiac, known as Shēngxiào, is based on a 12-year cycle, each year in that cycle relates to an animal sign. A typical 12-year cycle is shown in the table below. The pattern repeats, that is, 2024 will be another year of the Dragon, and 2011 was a year of the Rabbit, and so on.

Year	Symbolic animal
2012	Dragon
2013	Snake
2014	Horse
2015	Sheep/Goat
2016	Monkey
2017	Rooster
2018	Dog
2019	Pig
2020	Rat
2021	Ox
2022	Tiger
2023	Rabbit

Write a user-defined Octave function **Mysign** that reads a year from the user and displays the animal sign associated with that year.

Your program should work for any year greater than or equal to zero.

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Question 2 (Composite Magic Numbers)

Write a user-defined Octave function **Mynumber** which accepts two positive integers m and n, where $m < n$, as inputs and outputs all composite magic numbers in the range $[m, n]$ alongwith the frequency.

e.g. INPUT: $m = 1200 \quad n = 1300$

OUTPUT:

The composite magic numbers in the range are:

1207, 1216, 1225, 1234, 1243, 1252, 1261, 1270, 1288

Frequency of composite magic numbers in the range is: 9

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Notes:

a) Composite number: It is a number which has more than two factors.

e.g. $x = 10$

Factors of x are: $1, 2, 5, 10$.

b) Magic number: It is a number in which the eventual sum of the digits is 1.

e.g. x = 28 is a magic number because 2 + 8 = 10 = 1 + 0 = 1.

c) Composite Magic number: It is a positive integer which is both composite and a magic number.

Question 3 (Matrix as two-dimensional list)

Write a user-defined Octave function **Mymatrix** which accepts a square matrix [redacted] as input and:

a) Print the original matrix.
b) Print the order of the matrix.
c) Print the row and column position of the largest element of the matrix.
d) Print the row and column position of the second largest element of the matrix.
e) Sort the elements of each row in ascending order and print the new matrix B.

e.g. INPUT: A = [5, 1, 3; 7, 4, 6; 9, 8, 2]

OUTPUT:

$$A = \begin{matrix} 5 & 1 & 3 \\ 7 & 4 & 6 \\ 9 & 8 & 2 \end{matrix}$$

The order of the matrix is: 3.

The largest element 9 is in row 3 and column 1.

The second largest element 8 is in row 3 and column 2.

Sorted matrix

$$B = \begin{matrix} 1 & 3 & 5 \\ 4 & 6 & 7 \\ 2 & 8 & 9 \end{matrix}$$

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