# COMS W3101-2 Programming Languages: MATLAB
# Spring 2010 – Lecture 5 exercises

1. The file *groceries.txt* contains a shopping list and the record about when groceries on the list were bought. The format is the following:

   Name time1 time2 time3 … timeN
   Bananas , 0, 1, 1, … , 1

   Where a '1' under *timeL* means that the $L^{th}$ time we went shopping we bought Bananas, a '0' means we did not buy Bananas.
   We need to

   1.1. Read the list of names and a matrix containing the bought/non-bought variables into 2 separate variables
   1.2. Write a function named numBought() which takes as input, together with the list of names and the matrix, the name of a food item and returns the number of times the food item was bought
   1.3. Write a function named coBought() which takes as input, together with the list of names and the matrix, 2 food items and return the number of times both food items were bought together
   1.4. Consider all possible pairs of food items (x,y) and compute the co-occurrence score of each pair. The -occurrence score of each pair (x,y) is computed as
   Co-occurrence score(x,y) = $\frac{\text{\# times x and y were bought together}}{\text{\# times x was bought}}$
   Build a co-occurrence matrix M with items *x* as row indexes and items *y* as column indexes, and fill it with the values Co-occurrence score(x,y). For example, M(3,4) will contain the co-occurrence score of food item 3 and food item 4.
   1.5. Render the matrix M with the hot colormap, and show the colorbar as well
   1.6. The diagonal of the matrix M contains the maximum values, why?
   1.7. By looking at the colormap, which pair of items gets bought together more often?

2. Verify series convergence

   2.1. Verify that the series S1 = $\sum_{n=1}^{\infty} \frac{2}{n^2+2n}$ converges
   (HINT1: plot its values from n=1 to a sufficiently large n, say n= 10^4)
   (HINT2: use the MATLAB function *cumsum()* might be useful)

   2.2. Verify that the series S2 = $\sum_{n=1}^{\infty} (-1)^n \cdot \frac{n}{n+1}$ does NOT converge
   2.3. Plot the behavior of S1 and S2 for *n* up to 100 in 2 separate graphs in the same figure