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 Lth 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 co-occurrence score of each pair (x,y) is computed as

\[
\text{Co-occurrence score}(x,y) = \frac{\text{# times } x \text{ and } y \text{ were bought together}}{\text{# times } x \text{ was bought}}
\]

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 \( S_1 = \sum_{n=1}^{\infty} \frac{2}{n^2 + 2n} \) 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 \( S_2 = \sum_{n=1}^{\infty} (-1)^n \cdot \frac{n}{n+1} \) 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