% population
%H. Gollwitzer, June 29, 1998. This M-file organizes the matrix computations mentioned in the migration computational project.

% A is the migration matrix
% Column 1 describes the migration pattern from the city
% Column 2 gives the pattern from the suburbs
% The first entry in column 1 is the proportion who stay
% in the city and the second entry those that leave for suburbs
% A similar interpretation holds for the second column with
% respect to the suburbs. cs is the initial number of city and
% suburban dwellers, respectively.

% All proportions deal with a period of one year.
% p = .125; proportion who leave city for suburbs
% 1-p: proportion who stay in city
% q = .03; proportion who leave suburbs for city
% 1-q: proportion who stay in suburbs

A = [(1-p) q; p 1-q];

% Initial city population is 500 and suburbs is 50, in thousands.
cs = [500 50]';

history = cs; % storage for population data
pOld = cs; % current population
years = 55; % 55 may not be enough in some cases.

for k = 1:years
    pNew = A*pOld; % population after one year using matrix product
    history = [history pNew]; % This vector holds the population history
    pOld = pNew; % This assignment gets ready for next iteration(year).
end

%history(1,:) represents city population over time
%history(2,:) represents suburban population over time.

time = 0:(size(history,2)-1); % list of years

% Plot the time history of city and suburban populations for as
% many years as indicated by the for loop.

% Suburban population is marked with '+' in green, while
% that of the city is '+' in blue.
% Plot history vs. time, create string for title, and place same.

plot(time,history(1,:),'b+',time,history(2,:),'g*');
titlestr = sprintf('City/Suburban Population Migration With p = %5.3g',p);
title(titlestr); % Place title on current figure.

% sprintf is similar to the corresponding function in c.
% Check help xlabel or help ylabel for axis labeling.