% EF 105 Simultaneous Linear Equations Example

clear all, clc, format compact, format short;

%% Method 1 - rref - reduced row echelon form
% n equations, n unknowns
% equation matrix is n x (n+1)
% each row corresponds to an equation ex: first row is 4P - 2N + 3F = 30
AA = [4  -2  3  30  
      1   5  0   0  
      0   1 -1  10];
X = rref(AA)  % produces identity matrix and results

% extract results from last column
P = X(1,end)
N = X(2,end)
F = X(3,end)

% check first equation - should be 30
AA(1,1).*P + AA(1,2)*N + AA(1,3)*F

%% Method 2 - matrix left divide - backslash "\" (see help for description)
% coefficient matrix (n x n)
% each row corresponds to an equation
% each column contains the coefficients for a particular variable
%    P   N  F
A = [4  -2  3  
     1   5  0  
     0   1 -1 ];
B = [30 ; 0 ; 10];  % constant matrix (n x 1)
X = A \ B  % results (n x 1) [P;N;F]

% check - should be all zeros
A * X - B

%% Method 3 - inverse
X = inv(A)*B