LU Factorization (PARTIAL PIVOTING)

1) Ask the user to input a matrix. We will call it A. Has to be a squared matrix.

2) Now we take the size of matrix A and store in in a variable we will call n.

3) Next, we create 3 more matrices, we call them L, P and U. Matrices L, P and U need to have the following characteristics, they both need to be the same size as matrix A, all of the main diagonal elements of L and P will be 1 and the rest will be 0. All the elements of U will be 0.

4) Next step is to create an auxiliary variable we will call M and its initial value is the same as A.

5) Show the user the zero-step printing the matrices L and U.

6) Now we will begin to execute the method.

   a) we make a cycle for i=1 < n-1

      (i) to see if we must make a change in rows, we look for the absolute value of the biggest element of the ones below element M_{ii} and compare. If the absolute value of the element is greater than the absolute value of M_{ii} we need to change rows between the auxiliary variable, and we make the same change in the same rows of matrix P.

      (ii) Another cycle is needed for j=i+1 < n

         (1) If $M_{ji} \neq 0$ we then find the multipliers for the pivot and we assign them as elements of L : $L_{ji} = M_{ji} / M_{ii.}$

      (iii) Now the row operation commences for the elements of the matrix that are below the element $M_{ii.}$ Turning them all 0

      (iv) End cycle j

   b) Now we assign each element in row i of M and of row i in U and we add 1 to i so it can take the next element in the diagonal.

   c) Print each step so the user can see the process.

   d) End of cycle i

7) End of method