# Help for writing your own code

To help you write the code from scratch, you can find the code for a similar exercise at the following url

https://github.com/a-brugnoli/fea-class/tree/main/PC1/truss_example_1
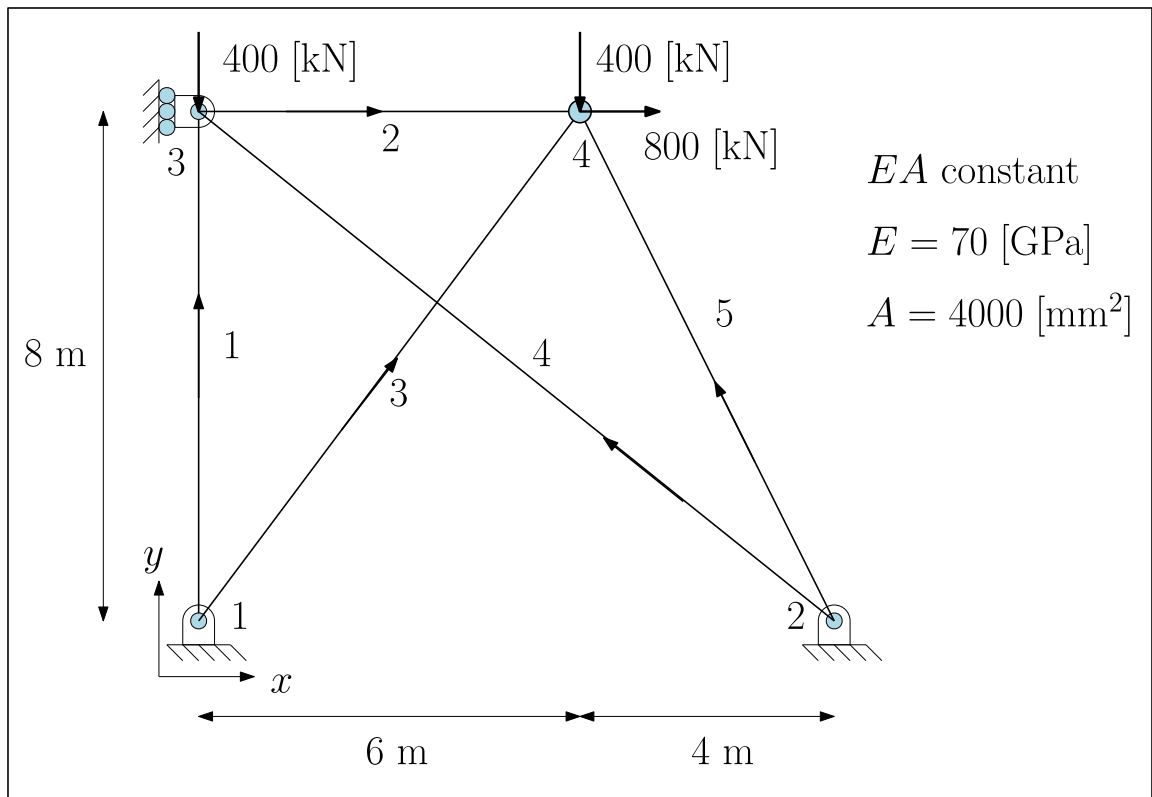
In particular the useful functions are found at this link:

https://github.com/a-brugnoli/fea-class/tree/main/src/fem/

You can copy the necessary functions from there.

# Analysis of a 2D truss problem

The following example is Example 3.9 at page 114 from *Kassimali, A. (2012). Matrix analysis of structures (Vol. 2). Cengage Learning.*



The bars number 3 and 4 do not actally cross each other. Find the displacements of the nodes, the reaction forces and the member axial forces.

You can then solve the the same problem but with a different loading condition.
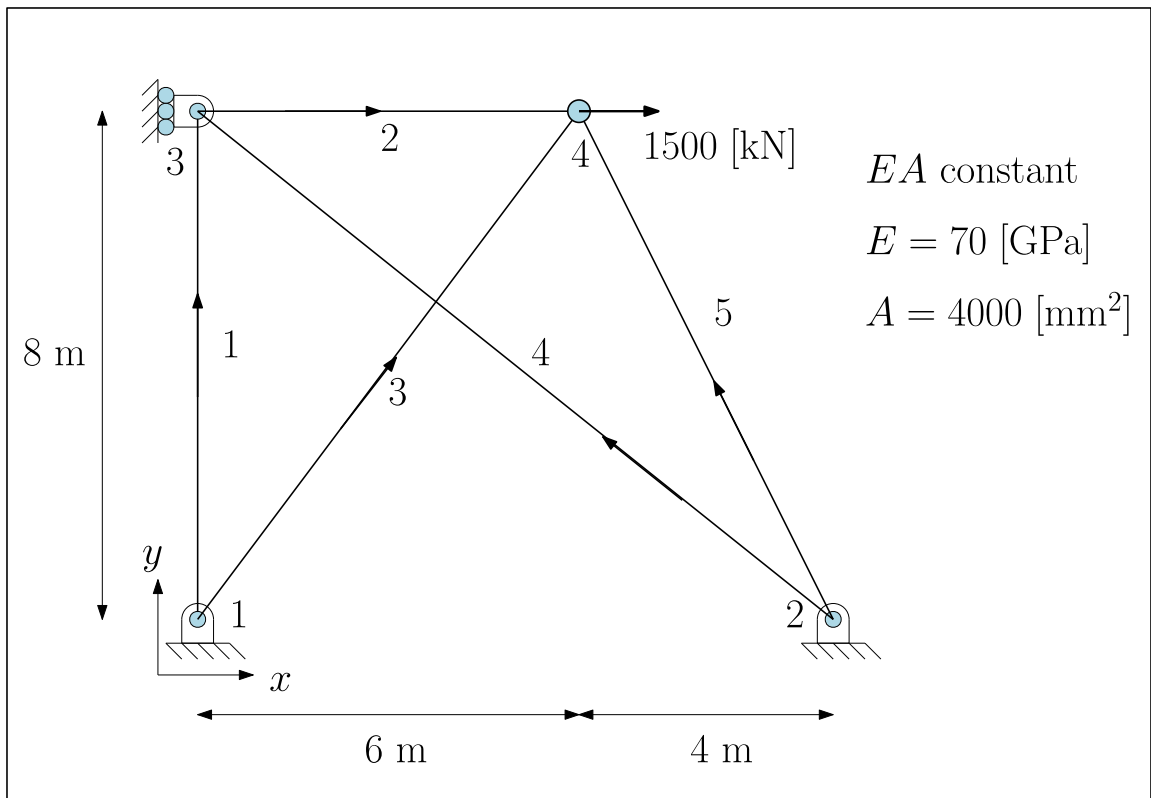
Since the structure is the same (same geometry, material and boundary conditions), the stiffness matrix is the same.

## To go further

The material used (Aluminium) has a yield strength of $\sigma_y = 400\,[\mathrm{MPa}]$. Given a safety factor of 2, the maxixum stress accettable in the structure is $\sigma_{max} = \frac{1}{2}\sigma_y = 200\,[\mathrm{MPa}]$. Optimize the truss section so that the maximum stress in the structure is attained but not exceeded. Use the first load case for this study.