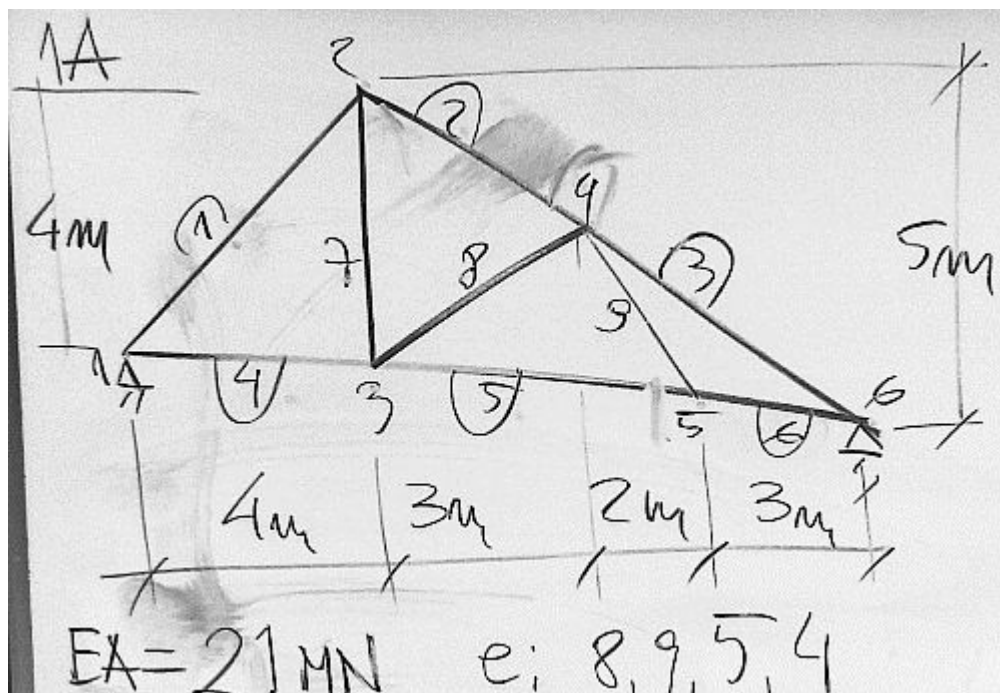


Macierze sztywności elementów kratownicy



elementy := (4, 5, 8, 9)

EA := 21 MN

$$\mathbf{K} = \begin{bmatrix}
 \text{1} & \text{2} & \text{3} & \text{4} & \text{5} & \text{6} \\
 \mathbf{J^1 + J^4} & \mathbf{-J^1} & \mathbf{-J^4} & & & \\
 & \mathbf{J^1 + J^2 + J^7} & \mathbf{-J^7} & \mathbf{-J^2} & & \\
 & & \mathbf{J^4 + J^5 + J^7 + J^8} & \mathbf{-J^8} & \mathbf{-J^5} & \\
 & & & \mathbf{J^2 + J^3 + J^8 + J^9} & \mathbf{-J^9} & \mathbf{-J^3} \\
 \text{Symetria} & \text{Symetria} & \text{Symetria} & \text{Symetria} & \mathbf{J^5 + J^6 + J^9} & \mathbf{-J^6} \\
 & & & & & \mathbf{J^3 + J^6}
 \end{bmatrix} \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \end{matrix}$$

Element "4" - blok macierzy sztywności

$$L_x := 4\text{m} \quad L_y := -\left(1\text{m} \cdot \frac{4}{12}\right) = -0.333333\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 4.013865\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 5196 & -433 \\ -433 & 36 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "5" - blok macierzy sztywności

$$L_x := 5\text{m} \quad L_y := -1\text{m} \cdot \frac{5}{12} = -0.416667\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 5.017331\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 4157 & -346 \\ -346 & 29 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "8" - blok macierzy sztywności

$$L_x := 3\text{m} \quad L_y := 5\text{m} \cdot \frac{5}{8} - 1\text{m} \cdot \frac{8}{12} = 2.458333\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 3.878583\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 3239 & 2654 \\ 2654 & 2175 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "9" - blok macierzy sztywności

$$L_x := 2\text{m} \quad L_y := 1\text{m} \cdot \frac{3}{12} - 5\text{m} \cdot \frac{5}{8} = -2.875\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 3.502231\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 1955 & -2811 \\ -2811 & 4041 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$