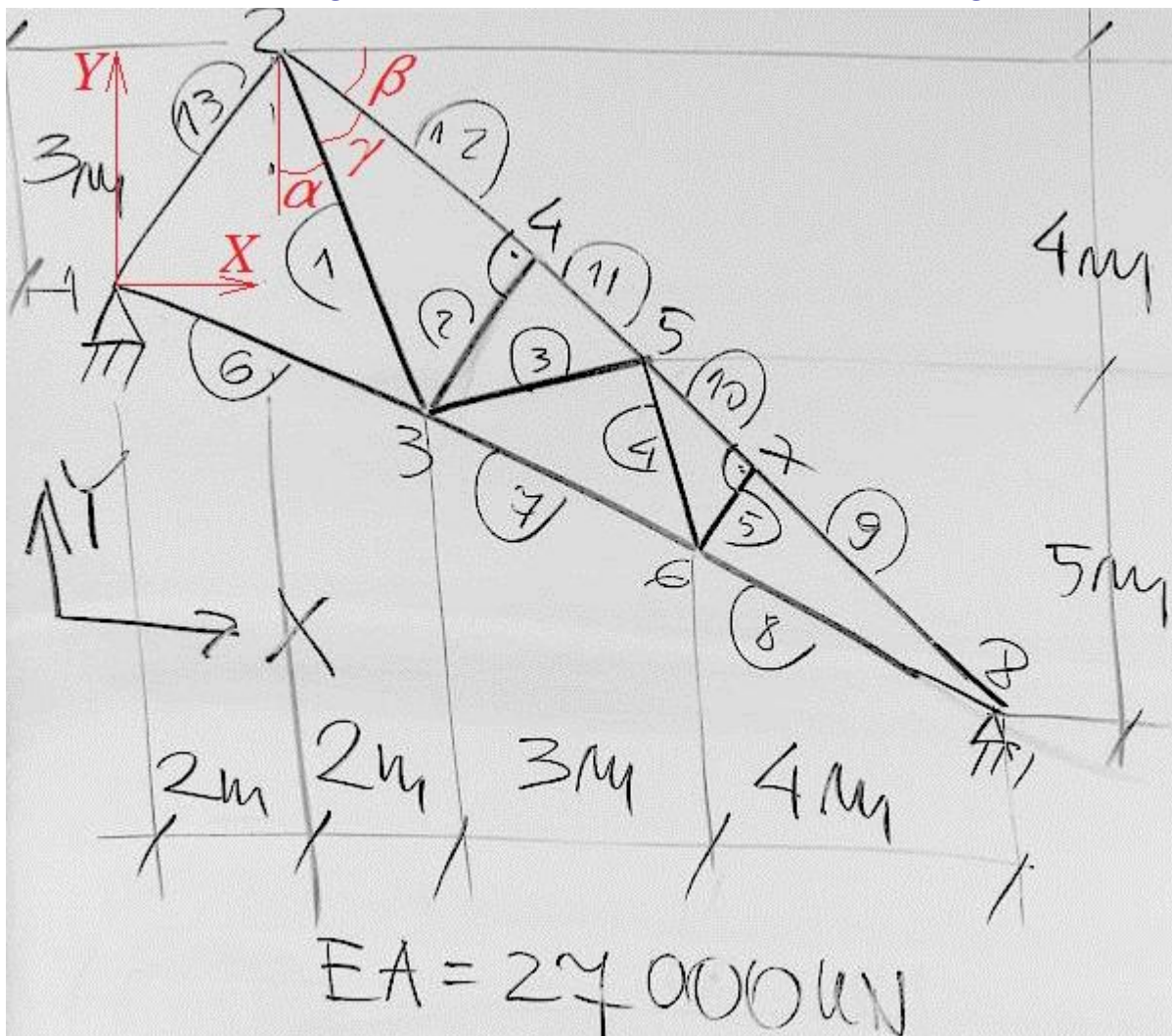


K1 Macierze sztywności elementów kratownicy



elementy := (1, 2, 3, 4)

EA := 27MN

dokładność $\pm 0.5 \text{ kN/m}$

$$Y3 := -6\text{m} \cdot \frac{4}{11} = -2.18182\text{m} \quad Y6 := -6\text{m} \cdot \frac{7}{11} = -3.81818\text{m} \quad X5 := 11\text{m} - 9\text{m} \cdot \frac{5}{9} = 6\text{m}$$

$$\alpha := \text{atan}\left(\frac{2\text{m}}{3\text{m} - Y3}\right) = 21.105 \cdot \text{deg} \quad \beta := \frac{\pi}{4} \quad \gamma := \frac{\pi}{4} - \alpha = 23.895 \text{ deg}$$

$$L1 := \sqrt{(2\text{m})^2 + (3\text{m} - Y3)^2} = 5.55439\text{m} \quad L12 := L1 \cdot \cos(\gamma) = 5.07831\text{m}$$

$$X4 := 2\text{m} + L12 \cdot \cos(\beta) = 5.59091\text{m}$$

$$Y4 := 3\text{m} - L12 \cdot \sin(\beta) = -0.59091\text{m}$$

$$Y5 := -1\text{m}$$

Element "1" - blok macierzy sztywności

$$L_x := 2\text{m} = 2\text{m}$$

$$L_y := Y_3 - 3\text{m} = -5.181818\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 5.554389\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 630 & (-1633) \\ -1633 & 4231 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "2" - blok macierzy sztywności

$$L_x := X_4 - 4\text{m} = 1.590909\text{m}$$

$$L_y := Y_4 - Y_3 = 1.590909\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 2.249885\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 6000 & (6000) \\ 6000 & 6000 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "3" - blok macierzy sztywności

$$L_x := X_5 - 4\text{m} = 2\text{m}$$

$$L_y := Y_5 - Y_3 = 1.181818\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 2.323079\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 8615 & (5090) \\ 5090 & 3008 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "4" - blok macierzy sztywności

$$L_x := 7\text{m} - X_5 = 1\text{m}$$

$$L_y := Y_6 - Y_5 = -2.818182\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 2.990343\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 1010 & (-2846) \\ -2846 & 8019 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$