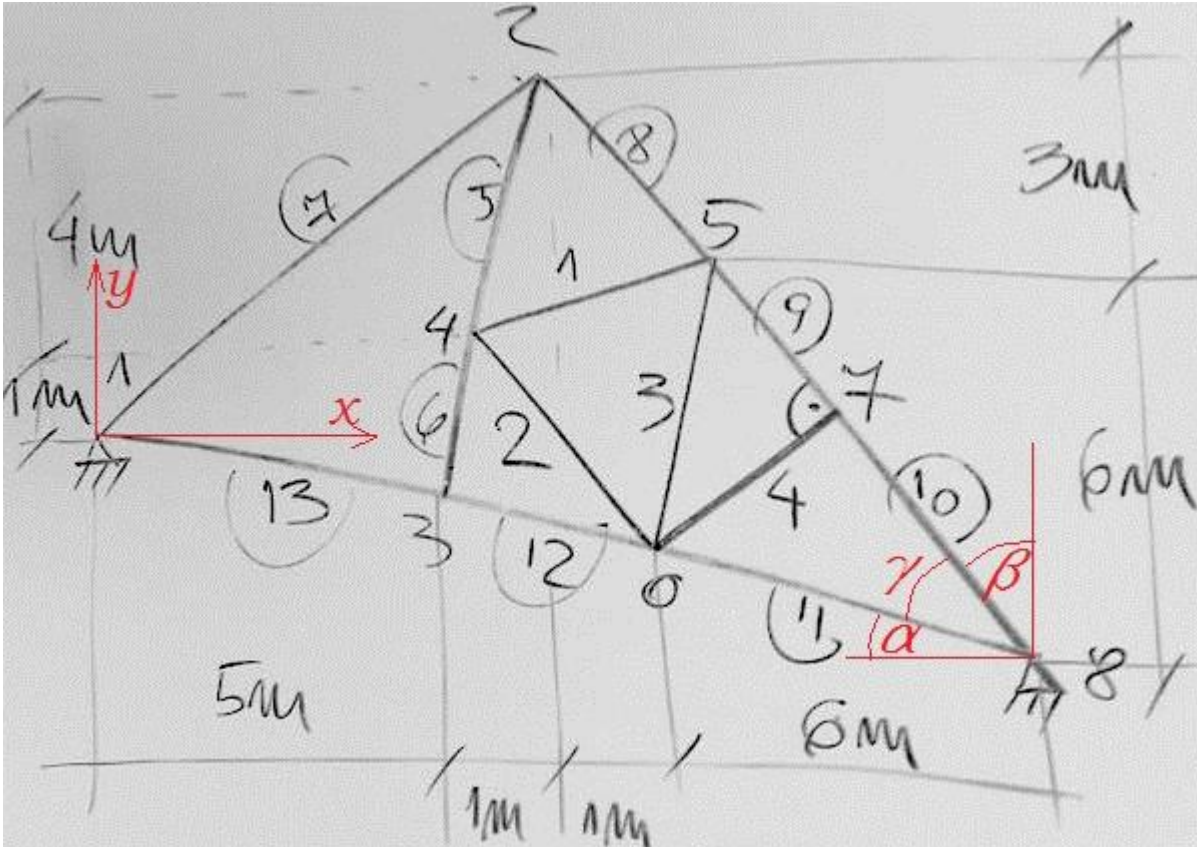


2B - Macierze sztywności elementów kratownicy



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

EA := 25MN

dokładność $\pm 0.5 \text{ kN/m}$

$$\alpha := \text{atan}\left(\frac{4}{13}\right) = 17.103 \cdot \text{deg}$$

$$\beta := \text{atan}\left(\frac{7}{9}\right) = 37.875 \cdot \text{deg}$$

$$\gamma := \frac{\pi}{2} - \alpha - \beta = 35.02229 \cdot \text{deg}$$

$$Y3 := -4\text{m} \cdot \frac{5}{13} = -1.538462\text{m}$$

$$Y6 := -4\text{m} \cdot \frac{7}{12} = -2.153846\text{m}$$

$$Y4 := 1\text{m}$$

$$X4 := 6\text{m} - 1\text{m} \cdot \frac{4\text{m}}{5\text{m} - Y3} = 5.388235\text{m}$$

$$X5 := 6\text{m} + 7\text{m} \cdot \frac{3}{9} = 8.333\text{m}$$

$$L11 := \sqrt{(6\text{m})^2 + (4\text{m} + Y6)^2} = 6.2776\text{m}$$

$$L10 := L11 \cdot \cos(\gamma) = 5.14091\text{m}$$

$$X7 := 13\text{m} - L10 \cdot \sin(\beta) = 9.84379\text{m}$$

$$Y7 := -4\text{m} + L10 \cdot \cos(\beta) = 0.05799\text{m}$$

Element "1" - blok macierzy sztywności

$$L_x := X_5 - X_4 = 2.9451 \text{ m}$$

$$L_y := 1 \text{ m} = 1.000000 \text{ m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 3.110242 \text{ m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 7207 & 2447 \\ (2447) & 831 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "2" - blok macierzy sztywności

$$L_x := 7 \text{ m} - X_4 = 1.611765 \text{ m}$$

$$L_y := Y_6 - Y_4 = -3.153846 \text{ m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 3.541826 \text{ m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 1462 & -2860 \\ (-2860) & 5597 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "3" - blok macierzy sztywności

$$L_x := X_5 - 7 \text{ m} = 1.333333 \text{ m}$$

$$L_y := 2 \text{ m} - Y_6 = 4.153846 \text{ m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 4.362593 \text{ m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 535 & 1668 \\ (1668) & 5195 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "4" - blok macierzy sztywności

$$L_x := X_7 - 7 \text{ m} = 2.843787 \text{ m}$$

$$L_y := Y_7 - Y_6 = 2.211834 \text{ m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 3.602684 \text{ m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 4324 & 3363 \\ (3363) & 2616 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$