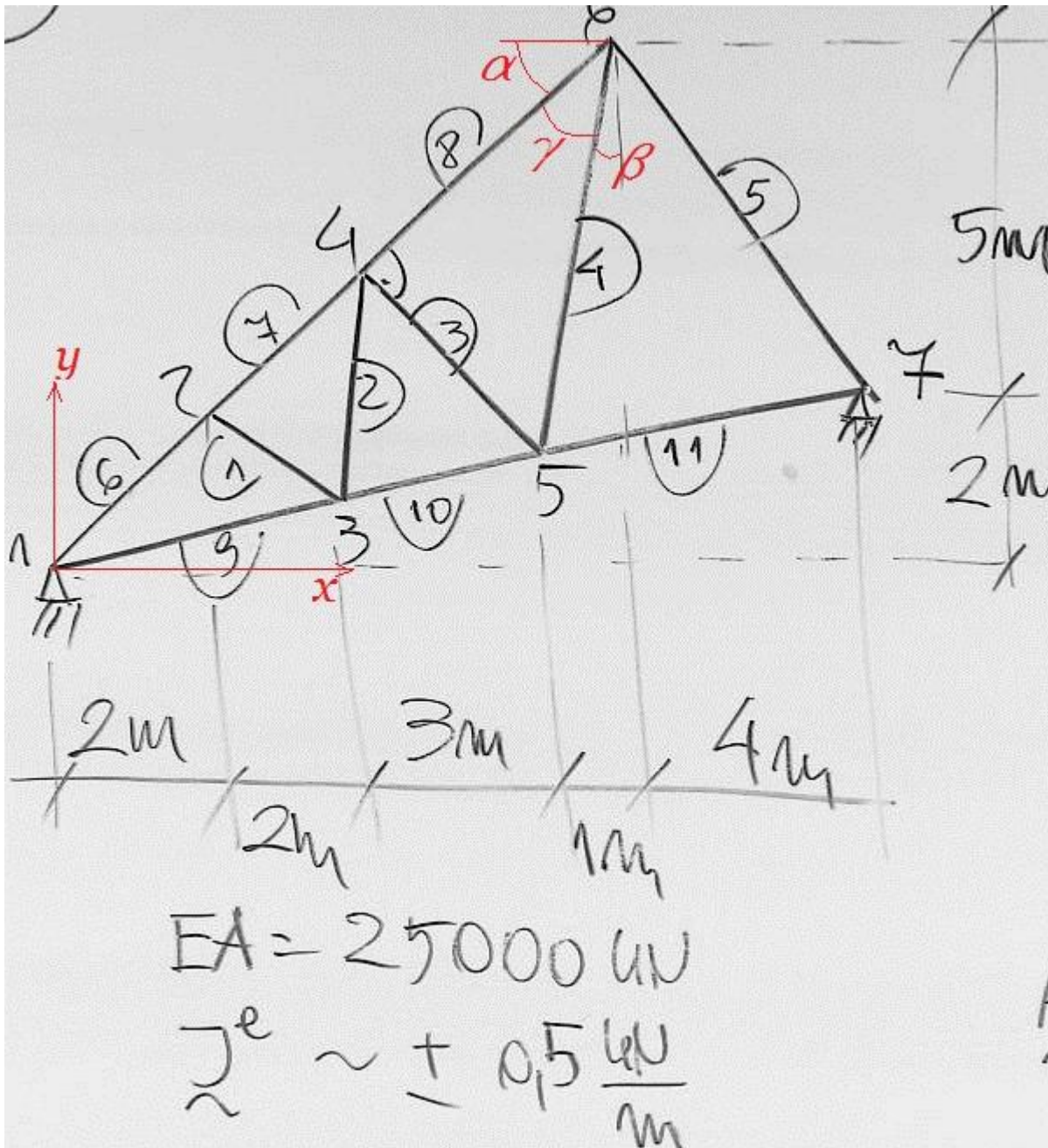


K2 - Macierze sztywności elementów kratownicy



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

$EA := 25 \text{ MN}$

dokładność $\pm 0.5 \text{ kN/m}$

$$\alpha := \text{atan}\left(\frac{7}{8}\right) = 41.186 \cdot \text{deg}$$

$$Y5 := 2\text{m} \cdot \frac{7}{12} = 1.16667\text{m}$$

$$\beta := \text{atan}\left(\frac{1\text{m}}{7\text{m} - Y5}\right) = 9.728 \cdot \text{deg}$$

$$Y3 := 2\text{m} \cdot \frac{4}{12} = 0.66667\text{m}$$

$$\gamma := \frac{\pi}{2} - \alpha - \beta = 39.0865 \cdot \text{deg}$$

$$L4 := \sqrt{(1\text{m})^2 + (7\text{m} - Y5)^2} = 5.91843\text{m}$$

$$L3 := L4 \cdot \sin(\gamma) = 3.73153\text{m}$$

$$L8 := L4 \cdot \cos(\gamma) = 4.59385\text{m}$$

$$Y2 := 7\text{m} \cdot \frac{2}{8} = 1.75\text{m}$$

$$X4 := 8\text{m} - L8 \cdot \cos(\alpha)$$

$$Y4 := 7\text{m} - L8 \cdot \sin(\alpha) = 3.97493\text{m}$$

Element "1" - blok macierzy sztywności

$$L_x := 2\text{m} = 2.00000\text{m}$$

$$L_y := Y_3 - Y_2 = -1.08333\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 2.274557\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 8498 & -4603 \\ (-4603) & 2493 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "2" - blok macierzy sztywności

$$L_x := X_4 - 4\text{m} = 0.542773\text{m}$$

$$L_y := Y_4 - Y_3 = 3.308260\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 3.352489\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 195 & 1191 \\ (1191) & 7262 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "3" - blok macierzy sztywności

$$L_x := 7\text{m} - X_4 = 2.457227\text{m}$$

$$L_y := Y_5 - Y_4 = -2.808260\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 3.731526\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 2905 & -3320 \\ (-3320) & 3795 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "4" - blok macierzy sztywności

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

$$L_y := 7\text{m} - Y_5 = 5.833333\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 5.918427\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 121 & 703 \\ (703) & 4104 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$