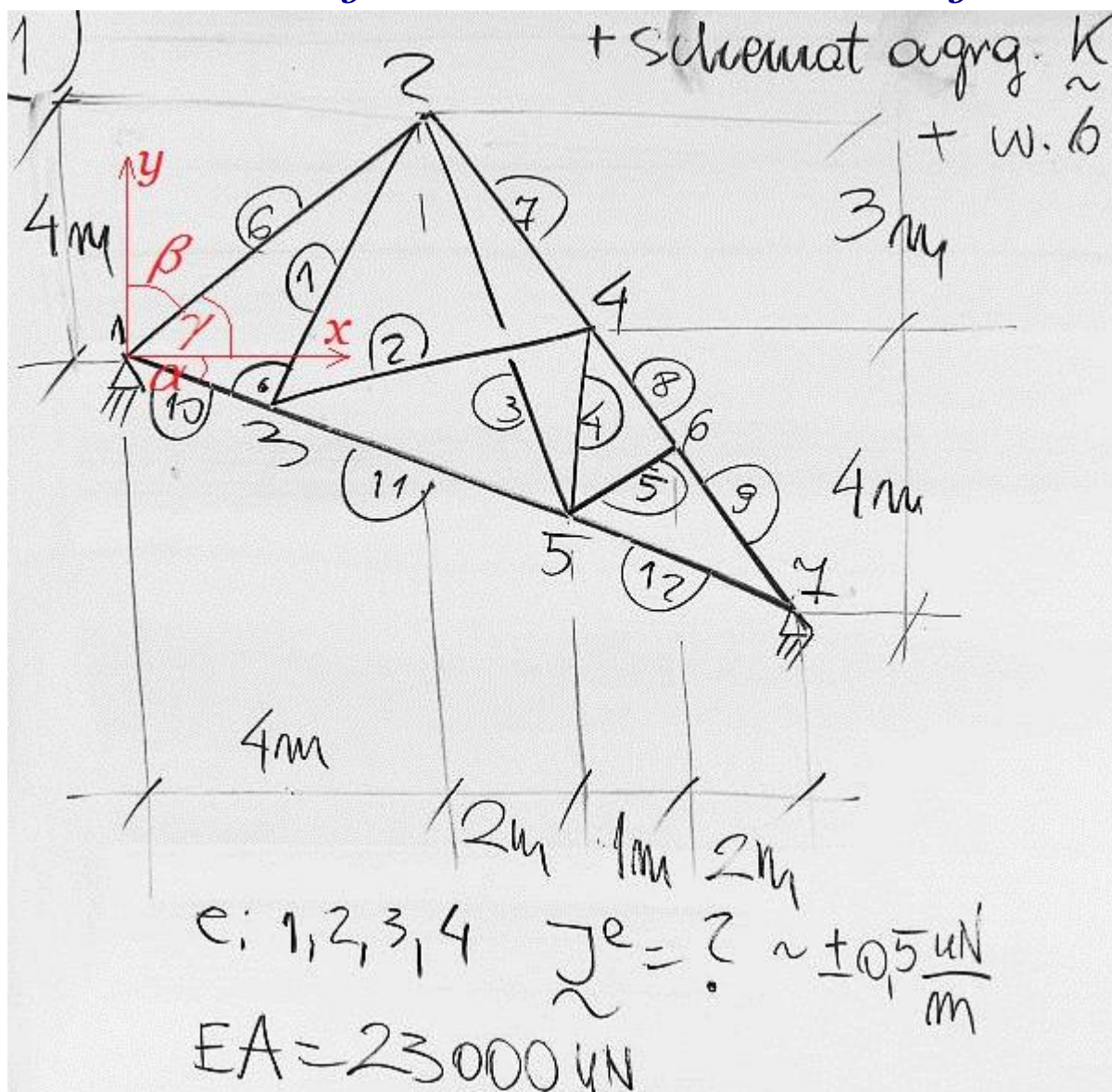


K1 - Macierze sztywności elementów kratownicy



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

EA := 23MN

dokładność $\pm 0.5 \text{ kN/m}$

$$\alpha := \text{atan}\left(\frac{3}{9}\right) = 18.435 \cdot \text{deg}$$

$$\beta := \text{atan}\left(\frac{4}{4}\right) = 45 \cdot \text{deg}$$

$$\gamma := \frac{\pi}{2} - \beta = 45 \cdot \text{deg}$$

$$L6 := 4\text{m} \cdot \sqrt{2} = 5.65685\text{m}$$

$$L10 := L6 \cdot \sin\left(\frac{\pi}{2} - \alpha - \gamma\right)$$

$$Y3 := -L10 \cdot \sin(\alpha) = -0.8\text{m}$$

$$X3 := L10 \cdot \cos(\alpha) = 2.4\text{m}$$

$$L10 = 2.52982\text{m}$$

$$Y5 := -3\text{m} \cdot \frac{6}{9} = -2\text{m}$$

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

$$X4 := 9\text{m} - 5\text{m} \cdot \frac{4}{7} = 6.14286\text{m}$$

Element "1" - blok macierzy sztywności

$$L_x := 4\text{m} - X3 = 1.60000\text{m}$$

$$L_y := 4\text{m} - Y3 = 4.80000\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 5.059644\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 455 & 1364 \\ (1364) & 4091 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "2" - blok macierzy sztywności

$$L_x := X4 - X3 = 3.742857\text{m}$$

$$L_y := Y4 - Y3 = 1.800000\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 4.153189\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 4498 & 2163 \\ (2163) & 1040 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "3" - blok macierzy sztywności

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

$$L_y := Y5 - 4\text{m} = -6.000000\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 6.324555\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 364 & -1091 \\ (-1091) & 3273 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "4" - blok macierzy sztywności

$$L_x := X4 - 6\text{m} = 0.142857\text{m}$$

$$L_y := Y4 - Y5 = 3.000000\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 3.003399\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 17 & 364 \\ (364) & 7641 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$