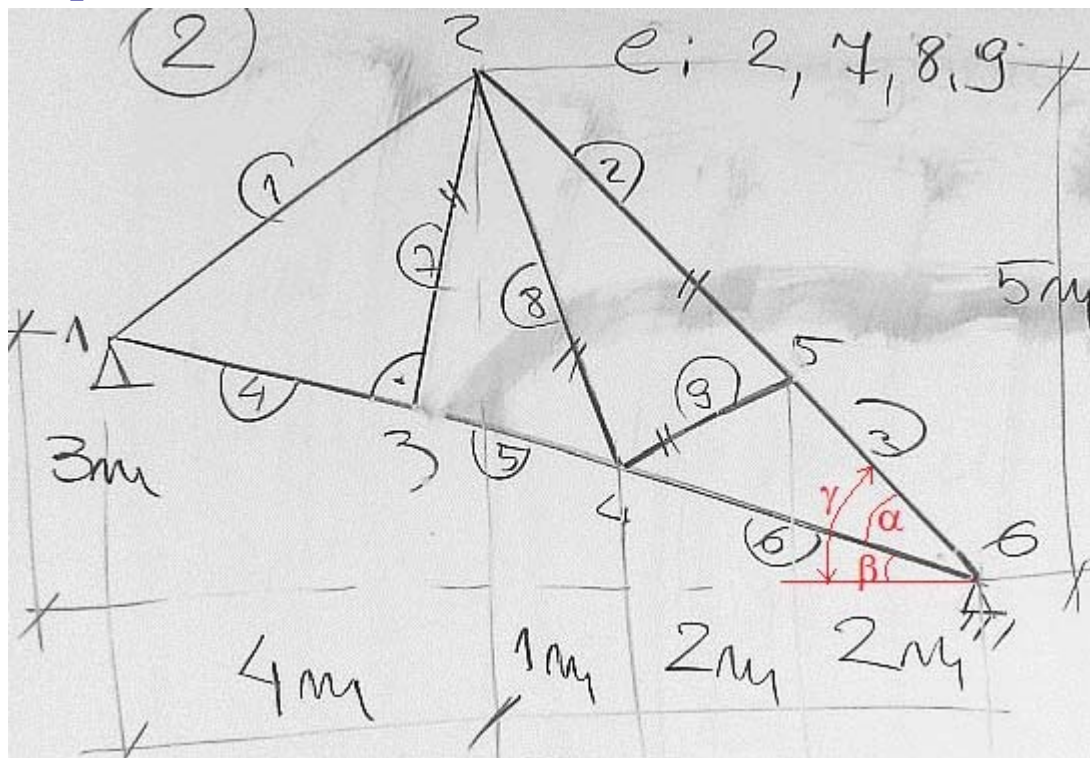


# Macierze sztywności elementów kratownicy

## Grupa 2



elementy := (2, 7, 8, 9)

EA := 25MN

$$\gamma := \text{atan}(1) = 45 \text{ deg} \quad \beta := \text{atan}\left(\frac{3}{9}\right) = 18.434949 \text{ deg}$$

$$\alpha := \gamma - \beta = 26.565051 \text{ deg}$$

$$L26 := 5\text{m}\sqrt{2} = 7.071068 \text{ m}$$

$$L36 := L26 \cdot \cos(\alpha) = 6.324555 \text{ m}$$

$$L36 \cdot \cos(\beta) = 6 \text{ m}$$

$$X3 := 9\text{m} - L36 \cdot \cos(\beta) = 3 \text{ m}$$

$$Y3 := -(3\text{m} - L36 \cdot \sin(\beta)) = -1 \text{ m}$$

### *Element "2" - blok macierzy sztywności*

$$L_x := 3\text{ m} \quad L_y := -3\text{ m} = -3\text{ m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 4.242641\text{ m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 2946 & -2946 \\ -2946 & 2946 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

### *Element "7" - blok macierzy sztywności*

$$L_x := 4\text{ m} - X3 = 1\text{ m} \quad L_y := 2\text{ m} - Y3 = 3\text{ m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 3.162278\text{ m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 791 & 2372 \\ 2372 & 7115 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

### *Element "8" - blok macierzy sztywności*

$$L_x := 1\text{ m} \quad L_y := -\left(5\text{ m} - \frac{4}{9} \cdot 3\text{ m}\right) = -3.666667\text{ m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 3.800585\text{ m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 455 & -1670 \\ -1670 & 6123 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

### *Element "9" - blok macierzy sztywności*

$$L_x := 2\text{ m} \quad L_y := 2\text{ m} - \frac{4}{9} \cdot 3\text{ m} = 0.666667\text{ m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 2.108185\text{ m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 10673 & 3558 \\ 3558 & 1186 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$