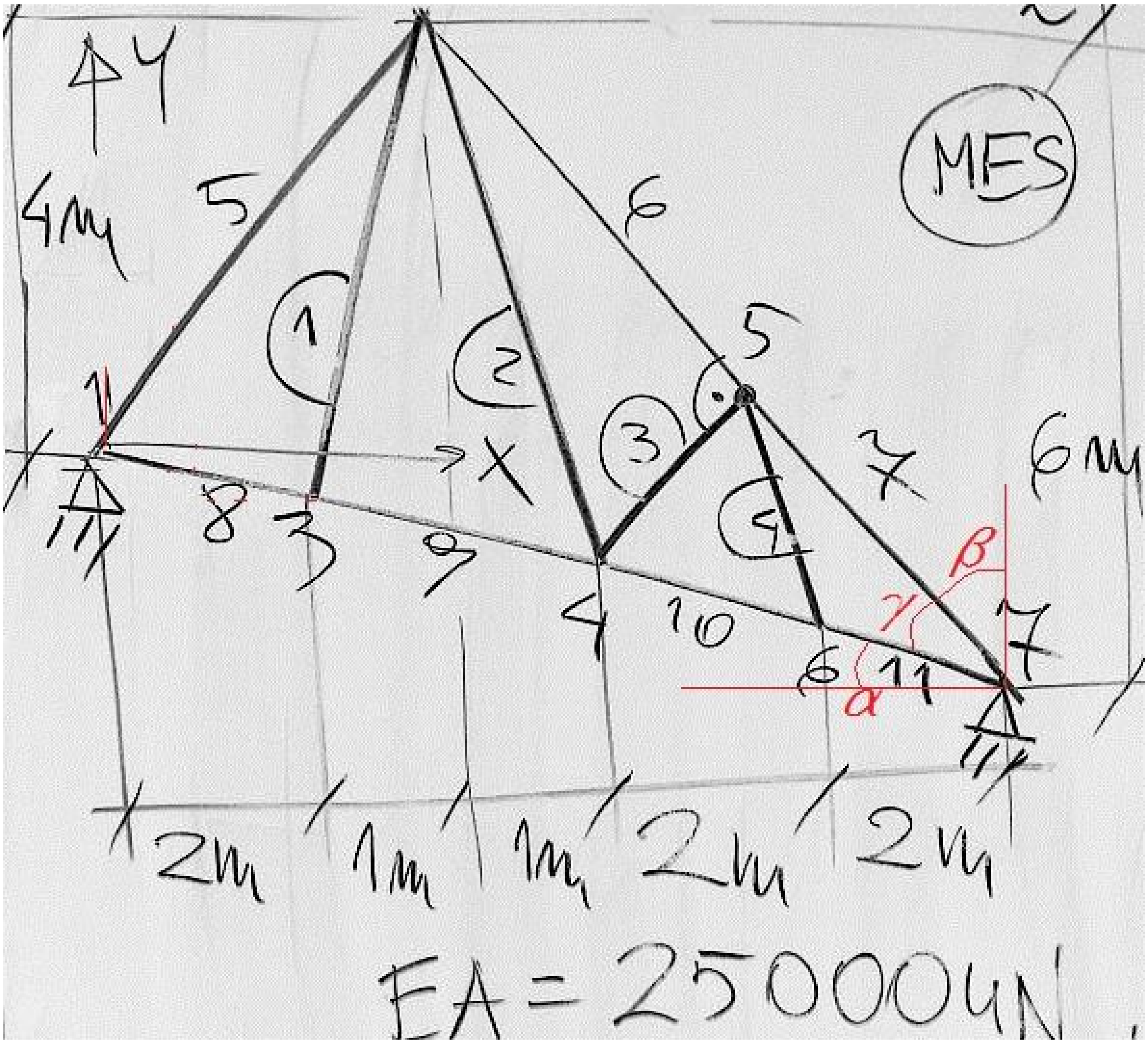
# *Macierze sztywności elementów kratownicy*




elementy := (1 , 2 , 3 , 4)  EA := 25MN  *dokładnść ±0.5kN/m*

$\alpha := \mathrm{atan}\left(\frac{2}{8}\right) = 14.036 \cdot \mathrm{deg}$  $\beta := \mathrm{atan}\left(\frac{5}{6}\right) = 39.806 \cdot \mathrm{deg}$

$\gamma := \frac{\pi}{2} - \alpha - \beta = 36.15819 \cdot \mathrm{deg}$

$Y3 := -2m \cdot \frac{2}{8}$  $Y4 := -2m \cdot \frac{4}{8}$  $Y6 := -2m \cdot \frac{6}{8}$

$L47 := \sqrt{(4m)^2 + (1m)^2} = 4.12311\,m$  $L7 := L47 \cdot \cos(\gamma) = 3.32896\,m$

$Y5 := L7 \cdot \cos(\beta) - 2m = 0.55738\,m$  $X5 := 8m - L7 \cdot \sin(\beta) = 5.86885\,m$

## *Element "1" - blok macierzy sztywności*

$Lx := 1m = 1\,m$ $\qquad$ $Ly := 4m - Y3 = 4.500000\,m$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 4.609772\,m$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{bmatrix} 255 & 1148 \\ (1148) & 5168 \end{bmatrix} \frac{kN}{m}$$

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

$Lx := 1m = 1\,m$ $\qquad$ $Ly := Y4 - 4m = -5.000000\,m$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 5.09902\,m$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{bmatrix} 189 & -943 \\ (-943) & 4714 \end{bmatrix} \frac{kN}{m}$$

## *Element "3" - blok macierzy sztywności*

$Lx := X5 - 4m = 1.868852\,m$ $\qquad$ $Ly := Y5 - Y4 = 1.557377\,m$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 2.432701\,m$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{bmatrix} 6065 & 5054 \\ (5054) & 4212 \end{bmatrix} \frac{kN}{m}$$

## *Element "4" - blok macierzy sztywności*

$Lx := 6m - X5 = 0.131148\,m$ $\qquad$ $Ly := Y6 - Y5 = -2.057377\,m$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 2.061553\,m$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{bmatrix} 49 & -770 \\ (-770) & 12078 \end{bmatrix} \frac{kN}{m}$$