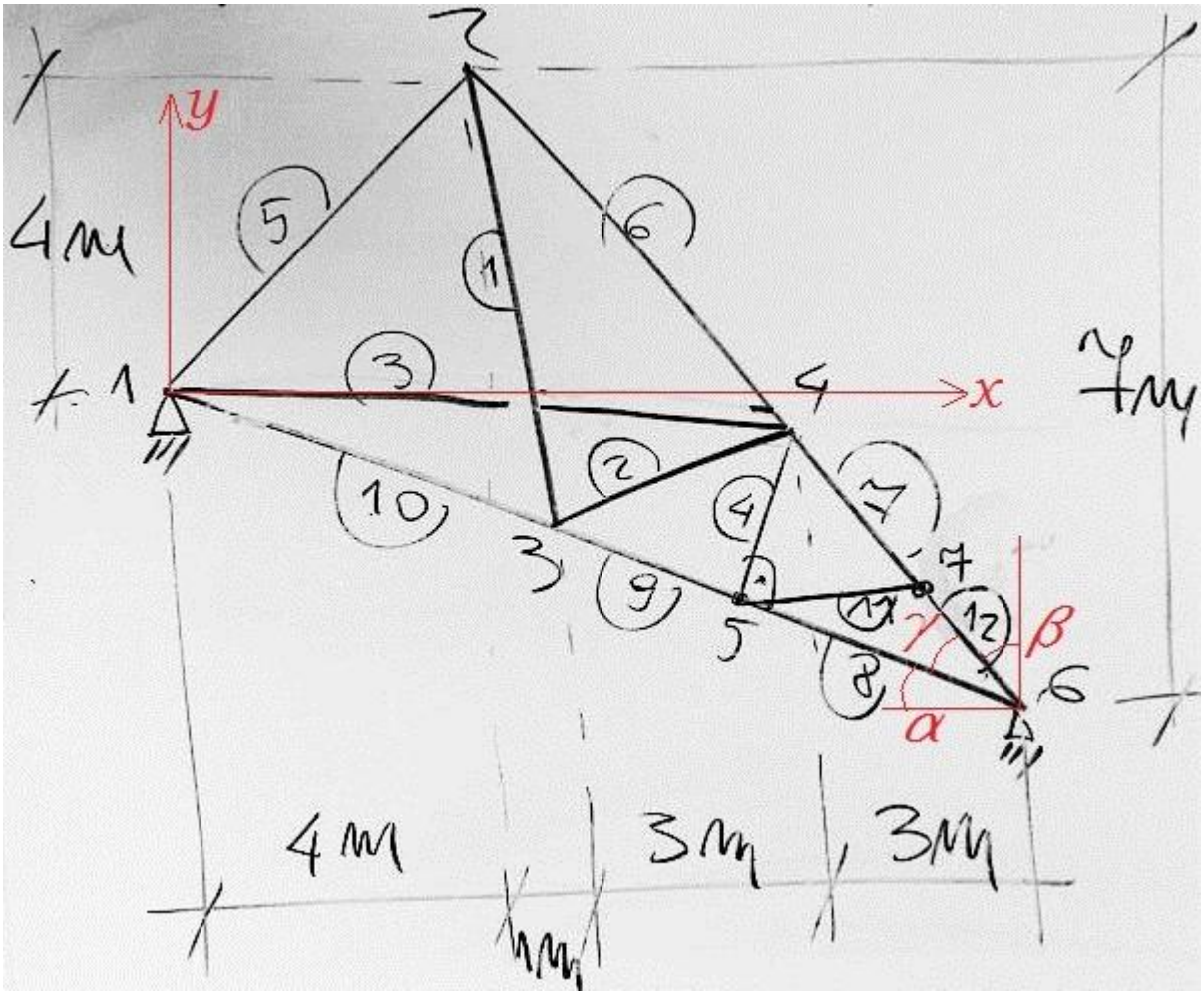
1A - Macierze sztywności elementów kratownicy



elementy := (1 , 2 , 3 , 4) EA := 21MN *dokładnść ±0.5kN/m*

$\alpha := \operatorname{atan}\left(\frac{3}{11}\right) = 15.255 \cdot \mathrm{deg}$ $\beta := \operatorname{atan}\left(\frac{7}{7}\right) = 45 \cdot \mathrm{deg}$

$\gamma := \frac{\pi}{2} - \alpha - \beta = 29.74488 \cdot \mathrm{deg}$

$Y3 := -3\mathrm{m} \cdot \frac{5}{11} = -1.364\,\mathrm{m}$ $Y4 := 4\mathrm{m} - 7\mathrm{m} \cdot \frac{4}{7} = 0\,\mathrm{m}$

$L712 := \sqrt{(3\mathrm{m})^2 + (3\mathrm{m})^2} = 4.24264\,\mathrm{m}$ $L8 := L712 \cdot \cos(\gamma) = 3.68364\,\mathrm{m}$

$X5 := 11\mathrm{m} - L8 \cdot \cos(\alpha) = 7.44615\,\mathrm{m}$ $Y5 := -3\mathrm{m} + L8 \cdot \sin(\alpha) = -2.03077\,\mathrm{m}$

Element "1" - blok macierzy sztywności

$Lx := 1m = 1\,m$ $\qquad Ly := Y3 - 4m = -5.363636\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 5.45606\,m$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{bmatrix} 129 & -693 \\ (-693) & 3720 \end{bmatrix} \frac{kN}{m}$$

Element "2" - blok macierzy sztywności

$Lx := 3m = 3\,m$ $\qquad Ly := Y4 - Y3 = 1.363636\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 3.295376\,m$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{bmatrix} 5281 & 2401 \\ (2401) & 1091 \end{bmatrix} \frac{kN}{m}$$

Element "3" - blok macierzy sztywności

$Lx := 8m$ $\qquad Ly := Y4 = 0.000000\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 8\,m$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{bmatrix} 2625 & 0 \\ (0) & 0 \end{bmatrix} \frac{kN}{m}$$

Element "4" - blok macierzy sztywności

$Lx := 8m - X5 = 0.553846\,m$ $\qquad Ly := Y4 - Y5 = 2.030769\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 2.104939\,m$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{bmatrix} 691 & 2533 \\ (2533) & 9286 \end{bmatrix} \frac{kN}{m}$$