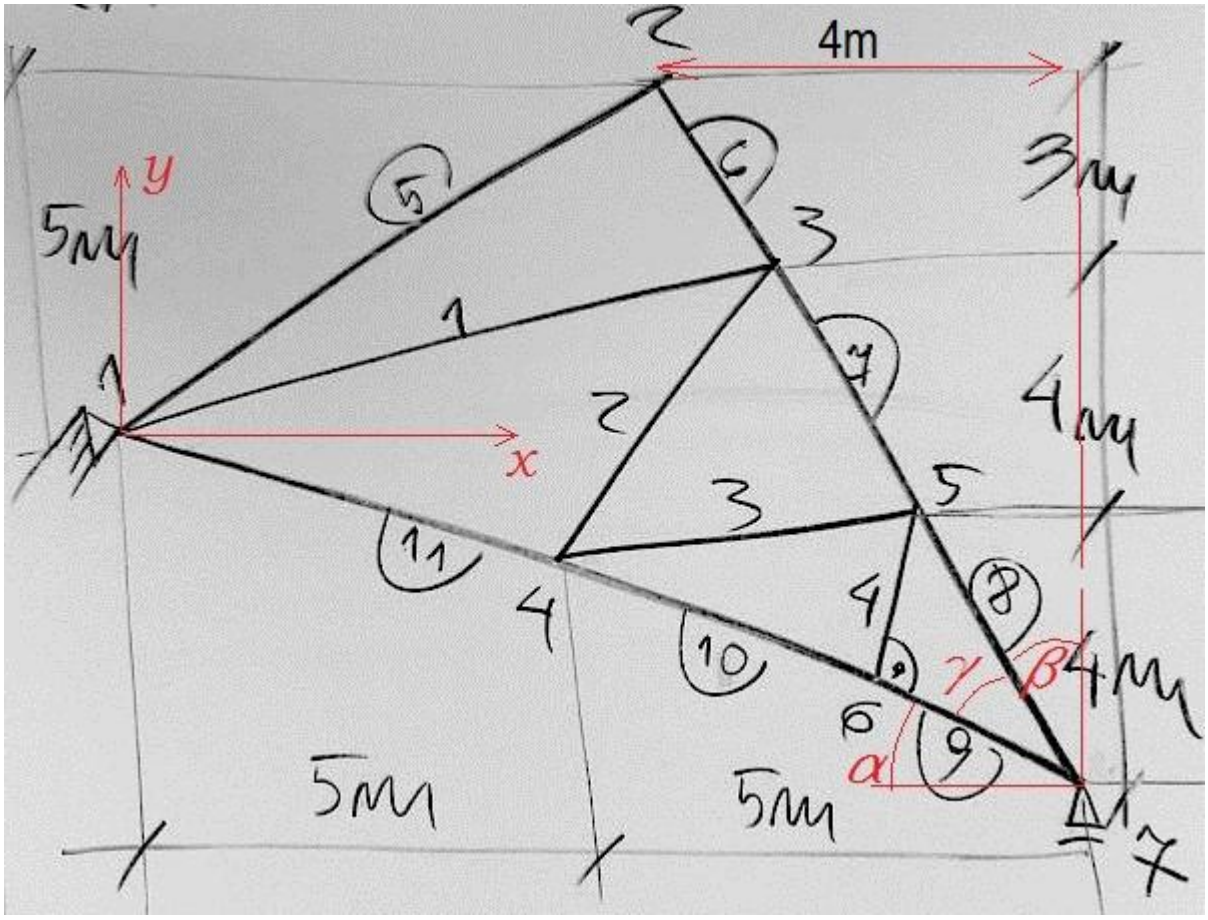
2A - Macierze sztywności elementów kratownicy



elementy := (1 , 2 , 3 , 4) EA := 27MN *dokładnść ±0.5kN/m*

$\alpha := \operatorname{atan}\left(\frac{6}{10}\right) = 30.964 \cdot \mathrm{deg}$

$\beta := \operatorname{atan}\left(\frac{4}{11}\right) = 19.983 \cdot \mathrm{deg}$

$\gamma := \frac{\pi}{2} - \alpha - \beta = 39.05314 \cdot \mathrm{deg}$

$X3 := 10\mathrm{m} - 4\mathrm{m} \cdot \frac{8}{11} = 7.091\,\mathrm{m}$ $Y4 := \frac{-6\mathrm{m}}{2} = -3\,\mathrm{m}$ $X5 := 10\mathrm{m} - 4\mathrm{m} \cdot \frac{4}{11} = 8.545\,\mathrm{m}$

$L8 := \sqrt{(4\mathrm{m})^2 + (10\mathrm{m} - X5)^2} = 4.25625\,\mathrm{m}$ $L9 := L8 \cdot \cos(\gamma) = 3.30525\,\mathrm{m}$

$X6 := 10\mathrm{m} - L9 \cdot \cos(\alpha) = 7.16578\,\mathrm{m}$ $Y6 := L9 \cdot \sin(\alpha) - 6\mathrm{m} = -4.29947\,\mathrm{m}$

Element "1" - blok macierzy sztywności

$Lx := X3 = 7.09091\,m$ $\qquad$ $Ly := 2m = 2.000000\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 7.367563\,m$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{bmatrix} 3395 & 957 \\ (957) & 270 \end{bmatrix} \frac{kN}{m} \; \frac{kN}{m}$$

Element "2" - blok macierzy sztywności

$Lx := X3 - 5m = 2.090909\,m$ $\qquad$ $Ly := 2m - Y4 = 5.000000\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 5.419585\,m$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{bmatrix} 742 & 1773 \\ (1773) & 4240 \end{bmatrix} \frac{kN}{m}$$

Element "3" - blok macierzy sztywności

$Lx := X5 - 5m = 3.545455\,m$ $\qquad$ $Ly := -2m - Y4 = 1.000000\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 3.683782\,m$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{bmatrix} 6789 & 1915 \\ (1915) & 540 \end{bmatrix} \frac{kN}{m}$$

Element "4" - blok macierzy sztywności

$Lx := X5 - X6 = 1.379679\,m$ $\qquad$ $Ly := -2m - Y6 = 2.299465\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 2.681614\,m$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{bmatrix} 2665 & 4442 \\ (4442) & 7403 \end{bmatrix} \frac{kN}{m}$$