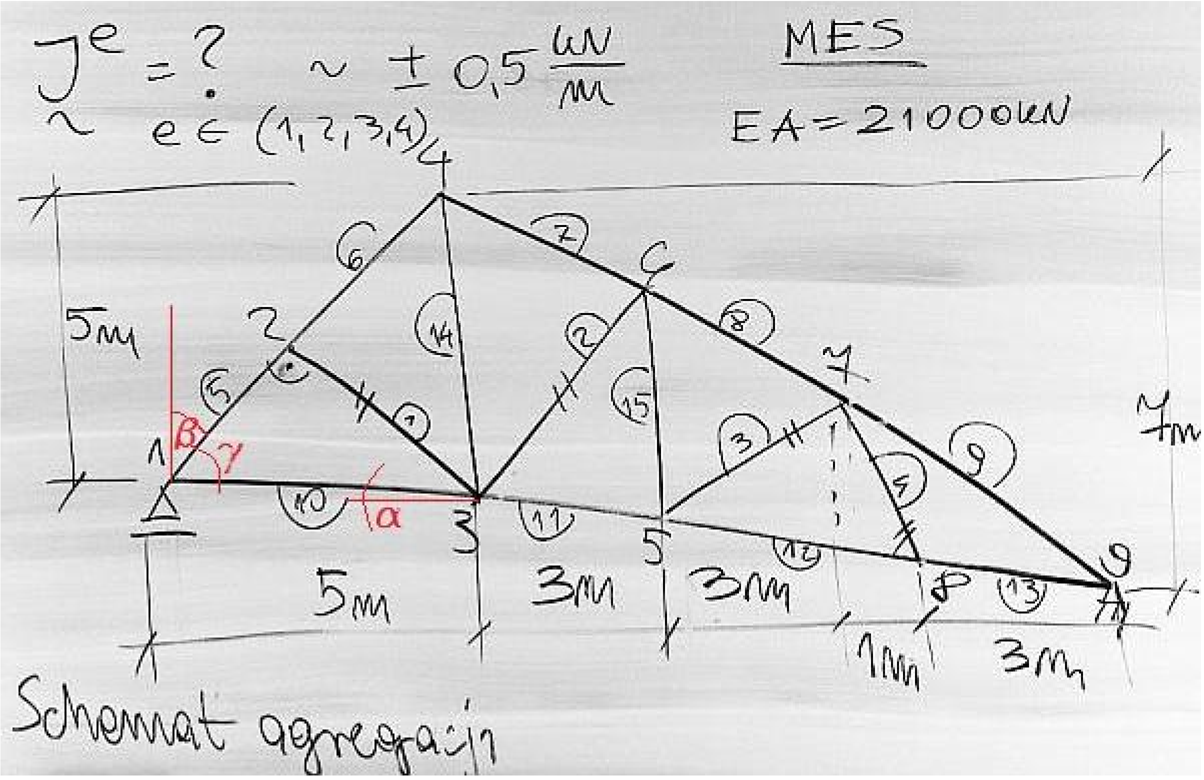
Macierze sztywności elementów kratownicy



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

$\alpha := \mathrm{atan}\left(\frac{2}{15}\right) = 7.595 \cdot \mathrm{deg}$ $\beta := \mathrm{atan}\left(\frac{5}{5}\right) = 45 \cdot \mathrm{deg}$

$\gamma := \frac{\pi}{2} - \alpha - \beta = 37.40536 \cdot \mathrm{deg}$

$Y3 := -2m \cdot \frac{5}{15}$ $Y5 := -2m \cdot \frac{8}{15}$ $Y6 := 5m - 7m \cdot \frac{3}{10}$ $Y7 := 5m - 7m \cdot \frac{6}{10}$

$Y8 := -2m \cdot \frac{12}{15}$

$L10 := \sqrt{(5m)^2 + (Y3)^2} = 5.04425m$ $L5 := L10 \cdot \cos(\gamma) = 4.00694m$

$Y2 := L5 \cdot \cos(\beta) = 2.83333m$ $X2 := L5 \cdot \sin(\beta) = 2.83333m$

Element "1" - blok macierzy sztywności

$Lx := 5m - X2 = 2.16667\,m$ $\qquad$ $Ly := Y2 = 2.833333\,m$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 3.566822\,m$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{bmatrix} (2172) & 2841 \\ 2841 & 3715 \end{bmatrix} \frac{kN}{m}$$

Element "2" - blok macierzy sztywności

$Lx := 3m = 3\,m$ $\qquad$ $Ly := Y6 - Y3 = 3.566667\,m$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 4.660591\,m$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{bmatrix} (1867) & 2220 \\ 2220 & 2639 \end{bmatrix} \frac{kN}{m}$$

Element "3" - blok macierzy sztywności

$Lx := 3m$ $\qquad$ $Ly := Y7 - Y5 = 1.866667\,m$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 3.533333\,m$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{bmatrix} (4285) & 2666 \\ 2666 & 1659 \end{bmatrix} \frac{kN}{m}$$

Element "4" - blok macierzy sztywności

$Lx := 1m = 1\,m$ $\qquad$ $Ly := Y8 - Y7 = -2.400000\,m$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 2.6\,m$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{bmatrix} (1195) & -2868 \\ -2868 & 6882 \end{bmatrix} \frac{kN}{m}$$