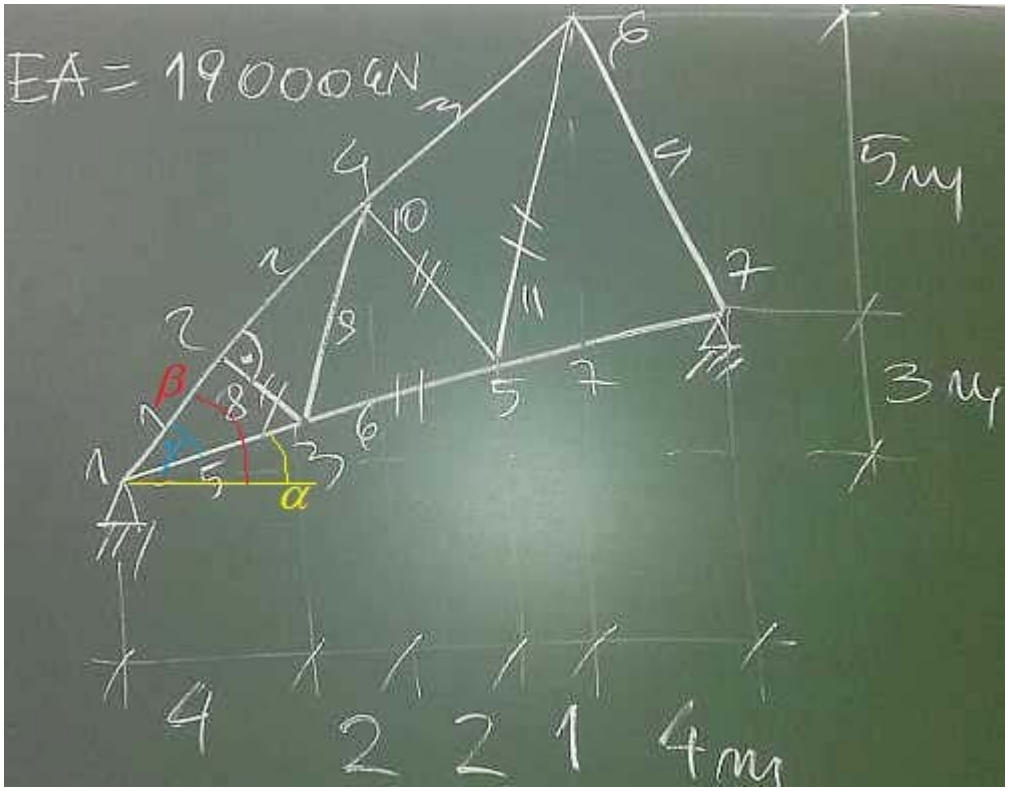
Macierze sztywności elementów kratownicy



$\alpha := \operatorname{atan}\left(\frac{3}{13}\right)$

$\beta := \operatorname{atan}\left(\frac{8}{9}\right)$

$\gamma := \beta - \alpha = 0.49984$

$\gamma = 28.639\,\text{deg}$

$EA := 19MN$

$elementy := (6, 8, 10, 11)$ *dokładnść ±0.5kN/m*

$Y3 := 3m \cdot \frac{4}{13} = 0.92308\,m$ $Y4 := 8m \cdot \frac{6}{9} = 5.3333\,m$ $Y5 := 3m \cdot \frac{8}{13} = 1.84615\,m$

$L5 := \sqrt{(3m)^2 + (Y3)^2} = 3.1388\,m$ $L8 := L5 \cdot \sin(\gamma) = 1.50439\,m$

$K =$

1	2	3	4	5	6	7	
J^1+J^5	$-J^1$	$-J^5$					1
	$J^1+J^2+J^8$	$-J^8$	$-J^2$				2
		J^6+J^6+ $+J^8+J^9$	$-J^9$	$-J^6$			3
			J^2+J^3+ $+J^9+J^{10}$	$-J^{10}$	$-J^3$		4
Symetria	Symetria	Symetria	Symetria	J^6+J^7+ $+J^{10}+J^{11}$	$-J^{11}$	$-J^7$	5
					$J^3+J^4+J^{11}$	$-J^4$	6
						J^4+J^7	7

Element "6" - blok macierzy sztywności

$Lx := 4m = 4\,m$ $\qquad Ly := Y5 - Y3 = 0.923077\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 4.105127\,m$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{pmatrix} 4394 & 1014 \\ 1014 & 234 \end{pmatrix} \cdot \frac{kN}{m}$$

Element "8" - blok macierzy sztywności

$Lx := L8 \cdot \sin(\beta) = 0.999462\,m$ $\qquad Ly := -L8 \cdot \cos(\beta) = -1.124395\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 1.50439\,m$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{pmatrix} 5574 & -6271 \\ -6271 & 7055 \end{pmatrix} \cdot \frac{kN}{m}$$

Element "10" - blok macierzy sztywności

$Lx := 2m$ $\qquad Ly := Y5 - Y4 = -3.487179\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 4.020003\,m$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{pmatrix} 1170 & -2040 \\ -2040 & 3557 \end{pmatrix} \cdot \frac{kN}{m}$$

Element "11" - blok macierzy sztywności

$Lx := 1m = 1\,m$ $\qquad Ly := 8m - Y5 = 6.153846\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 6.234567\,m$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{pmatrix} 78 & 482 \\ 482 & 2969 \end{pmatrix} \cdot \frac{kN}{m}$$