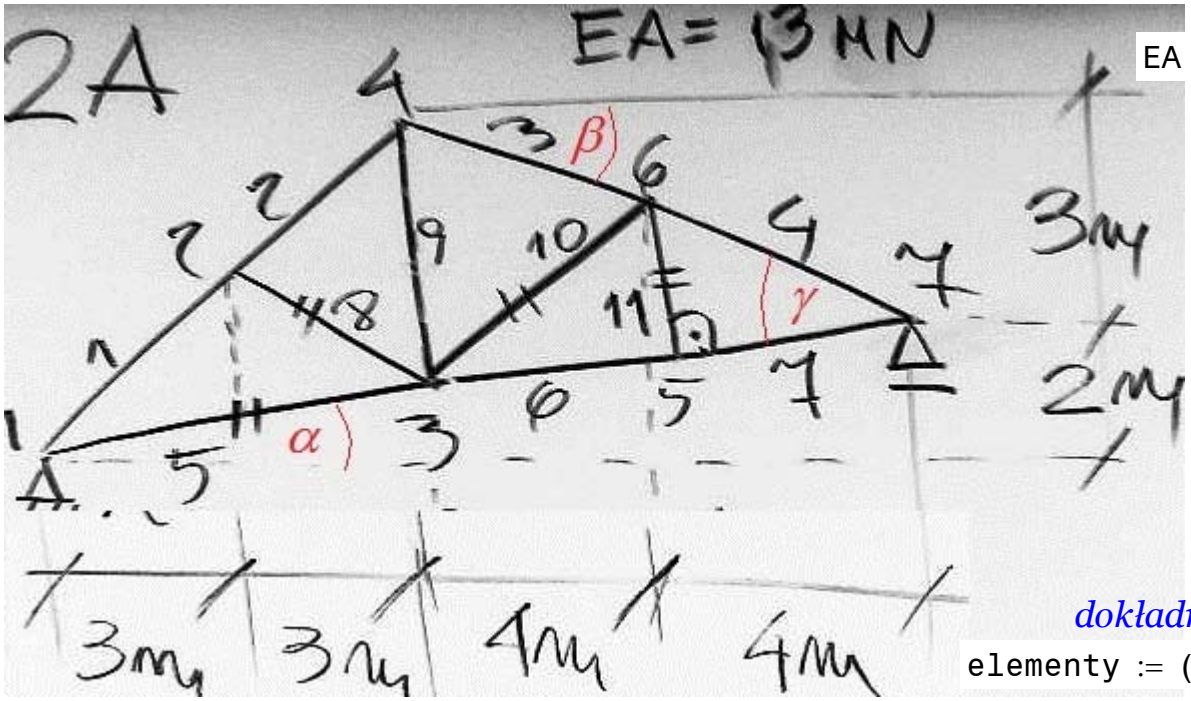
Macierze sztywności elementów kratownicy 2B



EA := 13MN

dokładnść ±0.5kN/m

elementy := (5 , 8 , 10 , 11)

$\alpha := \operatorname{atan}\left(\frac{2}{14}\right) = 8.13010\ \text{deg}$ $\beta := \operatorname{atan}\left(\frac{3}{8}\right) = 20.5560\ \text{deg}$

$\gamma := \beta + \alpha = 28.686148 \cdot \text{deg}$

$Y3 := 2\text{m} \cdot \frac{6}{14} = 0.85714\ \text{m}$ $Y6 := 2\text{m} + 3\text{m} \cdot \frac{4}{8} = 3.5\ \text{m}$

$L4 := \sqrt{(4\text{m})^2 + (Y6 - 2\text{m})^2} = 4.272\ \text{m}$ $L11 := L4 \cdot \sin(\gamma) = 2.05061\ \text{m}$

$K =$

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

Element "5" - blok macierzy sztywności

$Lx := 6m$ $\qquad Ly := Y3 = 0.857143\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 6.060915\,m$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{pmatrix} 2102 & 300 \\ 300 & 43 \end{pmatrix} \cdot \frac{kN}{m}$$

Element "8" - blok macierzy sztywności

$Lx := 3m = 3\,m$ $\qquad Ly := Y3 - \frac{5m}{2} = -1.642857\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 3.420377\,m$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{pmatrix} 2924 & -1601 \\ -1601 & 877 \end{pmatrix} \cdot \frac{kN}{m}$$

Element "10" - blok macierzy sztywności

$Lx := 4m = 4\,m$ $\qquad Ly := Y6 - Y3 = 2.642857\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 4.794235\,m$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{pmatrix} 1888 & 1247 \\ 1247 & 824 \end{pmatrix} \cdot \frac{kN}{m}$$

Element "11" - blok macierzy sztywności

$Lx := L11 \cdot \sin(\alpha) = 0.29\,m$ $\qquad Ly := -L11 \cdot \cos(\alpha) = -2.030000\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 2.05061\,m$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{pmatrix} 127 & -888 \\ -888 & 6213 \end{pmatrix} \cdot \frac{kN}{m}$$