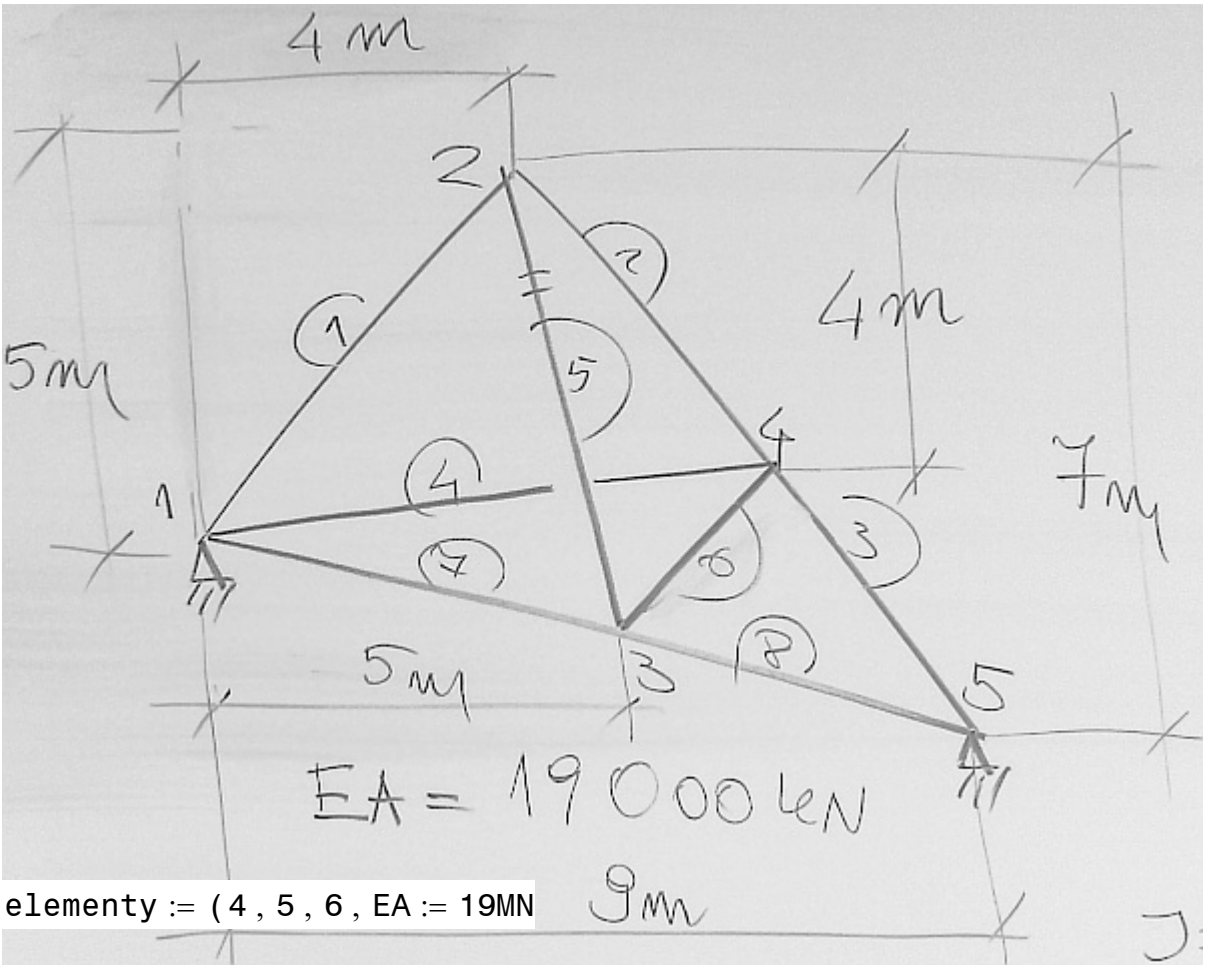
Macierze sztywności elementów kratownicy



elementy := (4 , 5 , 6 , EA := 19MN

$$Y3 := -2m \cdot \frac{5}{9} = -1.11111\,m \qquad X4 := 4m + 5m \cdot \frac{4}{7} = 6.85714\,m$$

$$\mathbf{K} = \begin{array}{c} \begin{matrix} 1 & 2 & 3 & 4 & 5 \end{matrix} \\ \begin{bmatrix} J^1+J^4+J^7 & -J^1 & -J^7 & -J^4 & \\ & J^1+J^2+J^5 & -J^5 & -J^2 & \\ & & J^5+J^6+J^7+J^8 & -J^6 & -J^8 \\ & & & J^2+J^3+J^4+J^6 & -J^3 \\ \text{Symetria} & \text{Symetria} & \text{Symetria} & \text{Symetria} & J^3+J^8 \end{bmatrix} \end{array} \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{matrix}$$

Element "4" - blok macierzy sztywności

$Lx := X4 = 6.85714\,m$ $\qquad$ $Ly := 1m = 1.000000\,m$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 6.929676\,m$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{pmatrix} 2685 & 392 \\ 392 & 57 \end{pmatrix} \cdot \frac{kN}{m}$$

Element "5" - blok macierzy sztywności

$Lx := 1m = 1.000000\,m$ $\qquad$ $Ly := Y3 - 5m = -6.111111\,m$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 6.192389\,m$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{pmatrix} 80 & -489 \\ -489 & 2988 \end{pmatrix} \cdot \frac{kN}{m}$$

Element "6" - blok macierzy sztywności

$Lx := X4 - 5m = 1.85714\,m$ $\qquad$ $Ly := 1m + 2m \cdot \frac{5}{9} = 2.111111\,m$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 2.81172\,m$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{pmatrix} 2948 & 3351 \\ 3351 & 3809 \end{pmatrix} \cdot \frac{kN}{m}$$

Element "7" - blok macierzy sztywności

$Lx := 5m = 5\,m$ $\qquad$ $Ly := Y3 = -1.111111\,m$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 5.121969\,m$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \qquad J = \begin{pmatrix} 3535 & -786 \\ -786 & 175 \end{pmatrix} \cdot \frac{kN}{m}$$