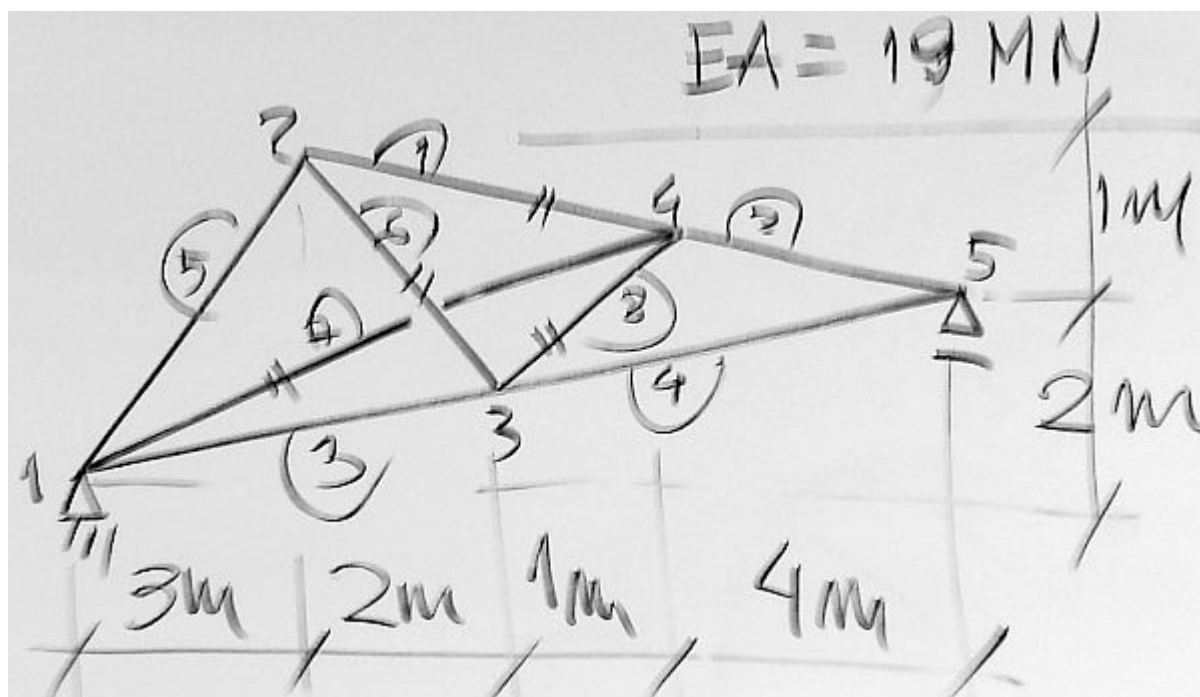


## Macierze sztywności elementów kratownicy



elementy := (1, 6, 7, 8)

EA := 19 MN

dokładność  $\pm 0.5 \text{ kN/m}$

$$Y3 := 2\text{m} \cdot \frac{5}{10} = 1.00000\text{m}$$

$$Y4 := \frac{4}{7} \cdot 1\text{m} + 2\text{m} = 2.57143\text{m}$$

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

### *Element "1" - blok macierzy sztywności*

$$L_x := 3\text{m} = 3\text{m}$$

$$L_y := Y_4 - 3\text{m} = -0.428571\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 3.030458\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix}$$

$$J = \begin{pmatrix} 6144 & -878 \\ -878 & 125 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

### *Element "6" - blok macierzy sztywności*

$$L_x := 2\text{m} = 2\text{m}$$

$$L_y := Y_3 - 3\text{m} = -2.000000\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 2.828427\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix}$$

$$J = \begin{pmatrix} 3359 & -3359 \\ -3359 & 3359 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

### *Element "7" - blok macierzy sztywności*

$$L_x := 6\text{m} = 6\text{m}$$

$$L_y := Y_4 = 2.571429\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 6.527806\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix}$$

$$J = \begin{pmatrix} 2459 & 1054 \\ 1054 & 452 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

### *Element "8" - blok macierzy sztywności*

$$L_x := 1\text{m}$$

$$L_y := Y_4 - Y_3 = 1.571429\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 1.862629\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix}$$

$$J = \begin{pmatrix} 2940 & 4620 \\ 4620 & 7260 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$