

ORIGIN := 1

B2

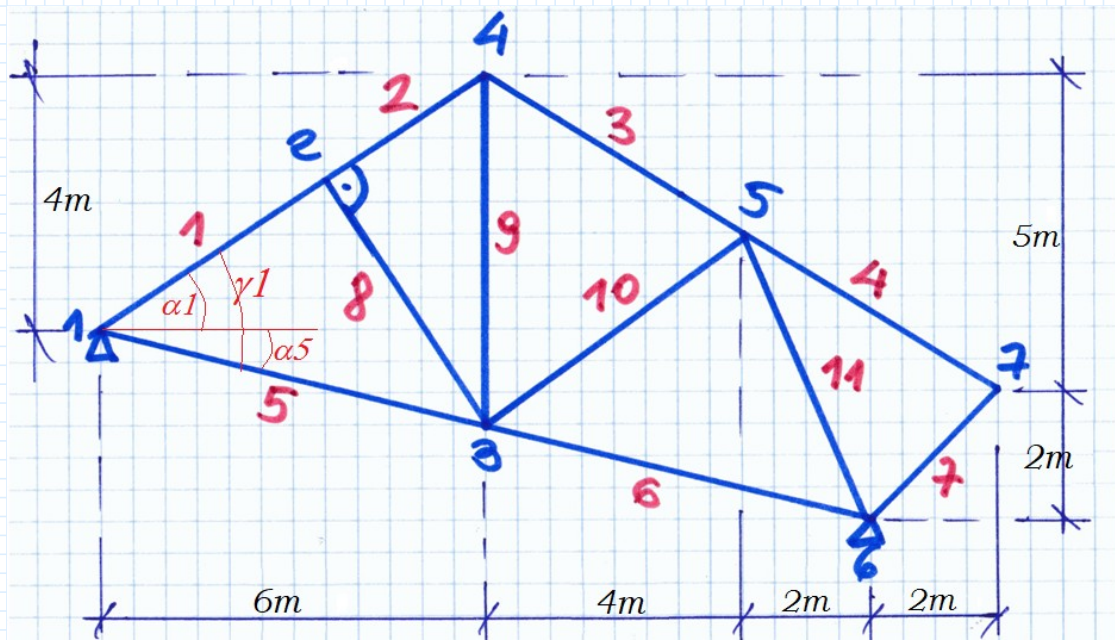
$EA := 28 \text{ MN}$

Elementy: 2, 7, 10, 11

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

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

Wyznaczyć bloki J macierzy sztywności elementów (2,7,10,11) kratownicy płaskiej.
Składowe macierze podać z dokładnością do +/- 0.05 kN/m



$$\alpha 1 := \operatorname{atan}\left(\frac{4}{6}\right) = 33.69007 \text{ deg}$$

$$\alpha 5 := \operatorname{atan}\left(\frac{3}{12}\right) = 14.03624 \text{ deg}$$

$$\gamma 1 := \alpha 1 + \alpha 5 = 47.72631 \text{ deg}$$

$$l5 := \sqrt{6^2 + \left(\frac{3 \cdot 6}{12}\right)^2} \text{ m} = 6.184658 \text{ m}$$

$$l1 := l5 \cdot \cos(\gamma 1) = 4.16025 \text{ m}$$

$$X2 := l1 \cdot \cos(\alpha 1) = 3.46154 \text{ m}$$

$$Y2 := l1 \cdot \sin(\alpha 1) = 2.30769 \text{ m}$$

Element "2"

$$Lx := 6 \text{ m} - X2 = 2.53846 \text{ m}$$

$$Ly := 4 \text{ m} - Y2 = 1.69231 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 3.050851 \text{ m}$$

$$J^2 = \begin{bmatrix} 6353.8 & 4235.9 \\ 4235.9 & 2823.9 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "7"

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

$$Ly := 2 \text{ m} = 2.000000 \text{ m}$$

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

$$J^7 = \begin{bmatrix} 4949.7 & 4949.7 \\ 4949.7 & 4949.7 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

$$Y5 := 4 \text{ m} - \frac{5 \text{ m} \cdot 4}{8} = 1.5 \text{ m}$$

$$Y3 := -3 \text{ m} \cdot \frac{6}{12} = -1.500000 \text{ m}$$

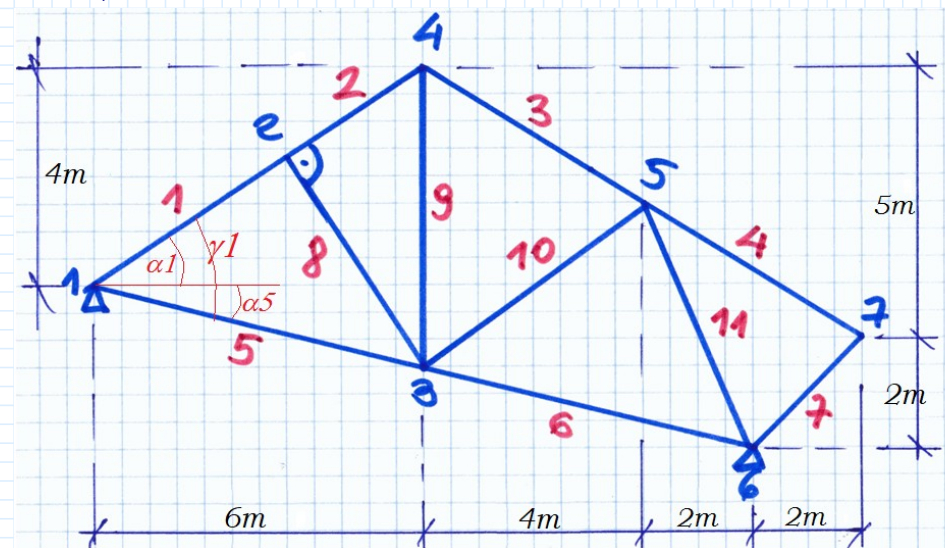
Element "10"

$$Lx := 4 \text{ m} = 4 \text{ m}$$

$$Ly := Y5 - Y3 = 3 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 5.000000 \text{ m}$$

$$J^{10} = \begin{bmatrix} 3584.0 & 2688.0 \\ 2688.0 & 2016.0 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$



Element "11"

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

$$Ly := -3 \text{ m} - Y5 = -4.5 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 4.924429 \text{ m}$$

$$J^{11} = \begin{bmatrix} 937.9 & -2110.2 \\ -2110.2 & 4748.1 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

