

ORIGIN := 1

A2

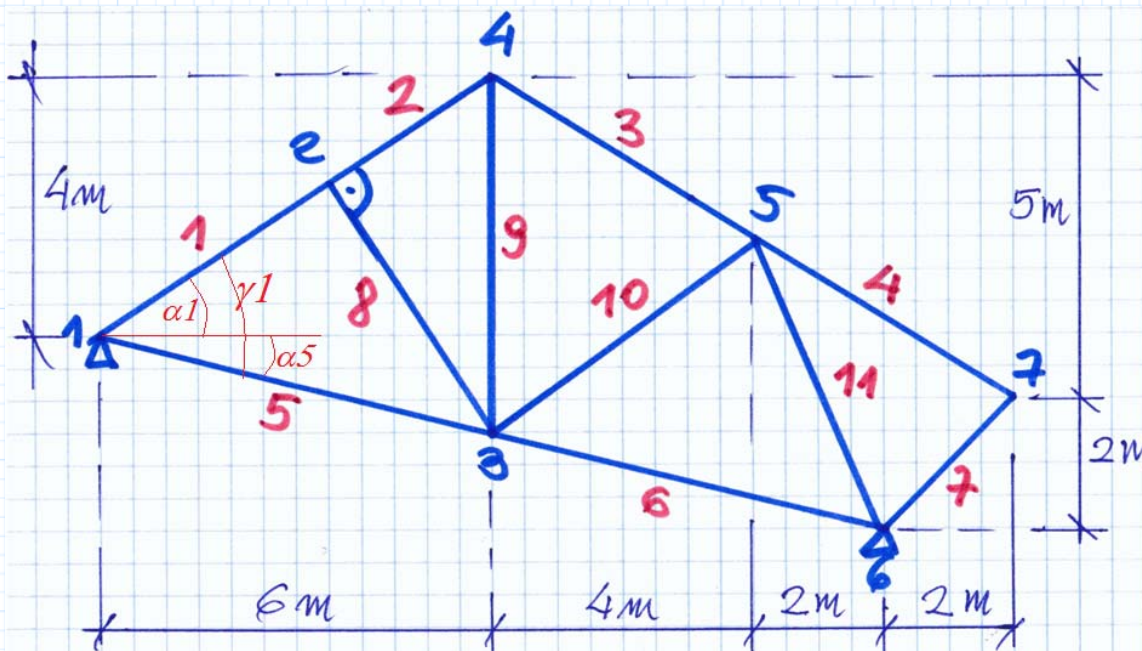
EA := 32 MN

Elementy: 2, 5, 8, 10

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

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

Wyznaczyć bloki **J** macierzy sztywności elementów (2,7,9,10) kratownicy płaskiej.
Sładowe macierze podać z dokładnością do +/- 0.05 kN/m



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

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

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

$$l 5 := \sqrt{6^2 + \left(\frac{3}{2}\right)^2} \text{ m} = 6.184658 \text{ m}$$

$$l 1 := l 5 \cdot \cos(\gamma 1) = 4.16025 \text{ m}$$

$$X 2 := l 1 \cdot \cos(\alpha 1) = 3.46154 \text{ m}$$

$$Y 2 := l 1 \cdot \sin(\alpha 1) = 2.30769 \text{ m}$$

Element "2"

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

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

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

$$J^2 = \begin{bmatrix} 7261.5 & 4841.0 \\ 4841.0 & 3227.3 \end{bmatrix} \frac{kN}{m}$$

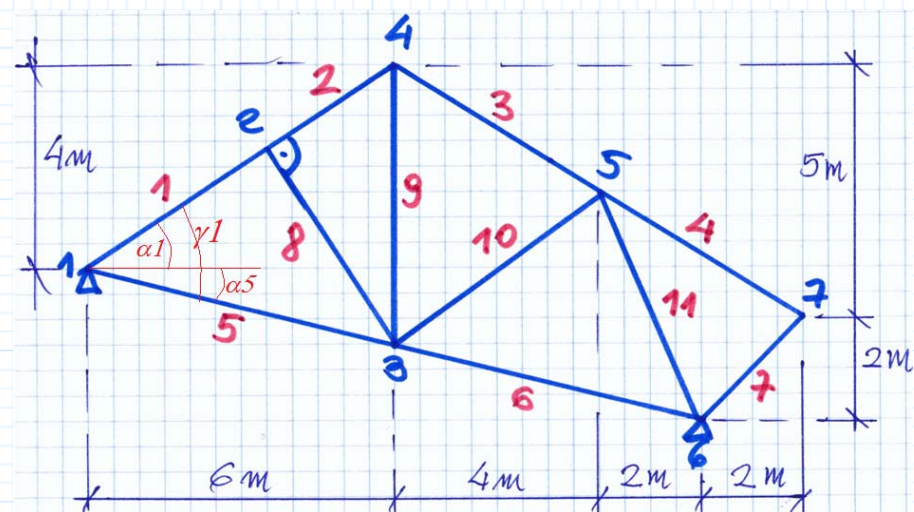
Element "5"

$$Y3 := -3 \text{ m} \cdot \frac{6}{12} = -1.5 \text{ m}$$

$$Lx := 6 \text{ m} \quad Ly := Y3 = -1.5 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 6.184658 \text{ m}$$

$$J^5 = \begin{bmatrix} 4869.7 & -1217.4 \\ -1217.4 & 304.4 \end{bmatrix} \frac{kN}{m}$$



Element "8"

$$Lx := 6 \text{ m} - X2 = 2.538462 \text{ m}$$

$$Ly := Y3 - Y2 = -3.807692 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 4.576277 \text{ m}$$

$$J^8 = \begin{bmatrix} 2151.6 & -3227.3 \\ -3227.3 & 4841.0 \end{bmatrix} \frac{kN}{m}$$

Element "10"

$$Y5 := 4 \text{ m} - 5 \text{ m} \cdot \frac{4}{8} = 1.50000 \text{ m}$$

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

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

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

$$J^{10} = \begin{bmatrix} 4096.0 & 3072.0 \\ 3072.0 & 2304.0 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

