

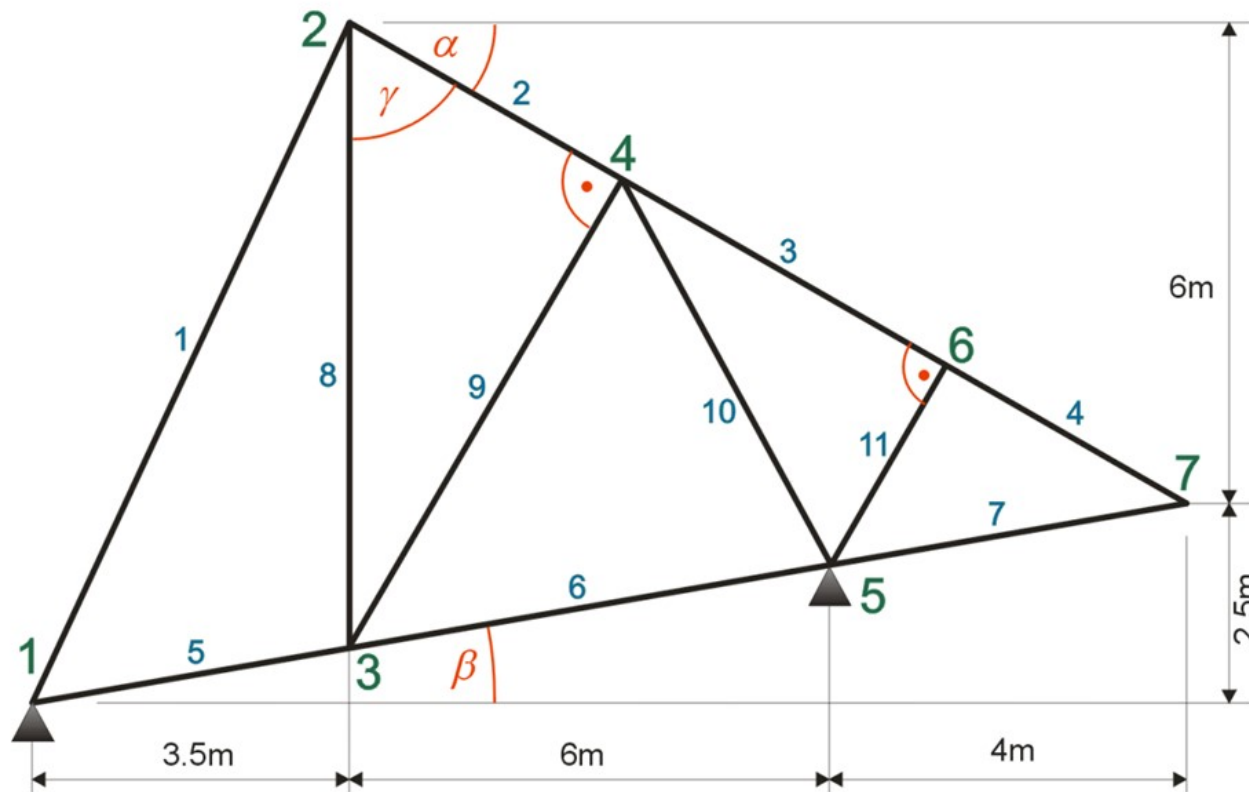
$$EA := 25 \text{ MN}$$

Elementy: 1, 5, 7, 9

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

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

Wyznaczyć bloki **J** macierzy sztywności elementów kratownicy płaskiej.  
Sładowe macierze podać z dokładnością do +/- 0.05 kN/m



$$\alpha := \text{atan}\left(\frac{6}{10}\right) = 30.9637565 \text{ deg}$$

$$\gamma := \frac{\pi}{2} - \alpha = 59.0362435 \text{ deg}$$

$$\text{tg}\beta := \frac{2.5}{13.5} = 0.1851852$$

$$Y3 := \text{tg}\beta \cdot 3.5 \text{ m} = 0.6481481 \text{ m}$$

$$Y5 := \text{tg}\beta \cdot 9.5 \text{ m} = 1.7592593 \text{ m}$$

$$l8 := 8.5 \text{ m} - Y3 = 7.8518519 \text{ m}$$

$$l2 := l8 \cdot \cos(\gamma) = 4.0397445 \text{ m}$$

$$X4 := 3.5 \text{ m} + l2 \cdot \cos(\alpha) = 6.9640523 \text{ m}$$

$$Y4 := 8.5 \text{ m} - l2 \cdot \sin(\alpha) = 6.4215686 \text{ m}$$

Element "1"

$$Lx := 3.5 \text{ m} = 3.5 \text{ m}$$

$$Ly := 8.5 \text{ m} = 8.50000 \text{ m}$$

$$\bar{L} := \sqrt{(Lx)^2 + (Ly)^2} = 9.1923882 \text{ m}$$

$$J^1 = \begin{bmatrix} 394.3 & 957.5 \\ 957.5 & 2325.4 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

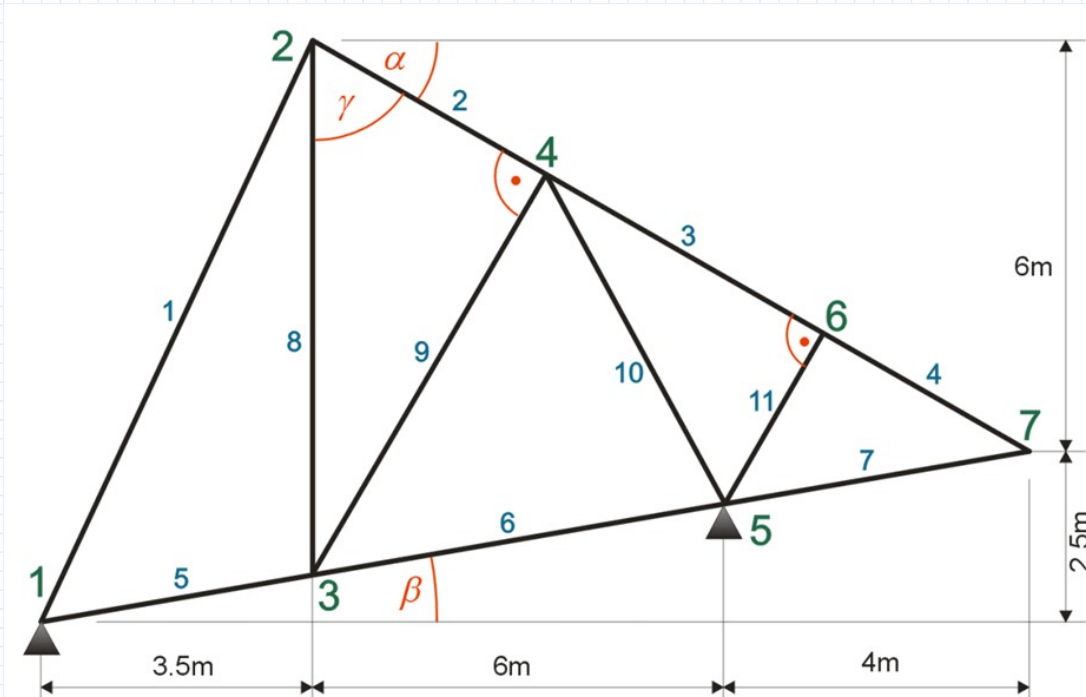
Element "5"

$$\bar{L}x := 3.5 \text{ m} = 3.5 \text{ m}$$

$$\bar{L}y := Y3 = 0.648148 \text{ m}$$

$$\bar{L} := \sqrt{(\bar{L}x)^2 + (\bar{L}y)^2} = 3.559508 \text{ m}$$

$$J^5 = \begin{bmatrix} 6790.6 & 1257.5 \\ 1257.5 & 232.9 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$



Element "7"

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

$$Ly := 2.5 \text{ m} - Y5 = 0.740741 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 4.0680090 \text{ m}$$

$$J^7 = \begin{bmatrix} 5941.7 & 1100.3 \\ 1100.3 & 203.8 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "9"

$$Lx := X4 - 3.5 \text{ m} = 3.464052 \text{ m}$$

$$Ly := Y4 - Y3 = 5.77342 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 6.732907 \text{ m}$$

$$J^9 = \begin{bmatrix} 982.9 & 1638.1 \\ 1638.1 & 2730.2 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

