

ORIGIN := 1

B1

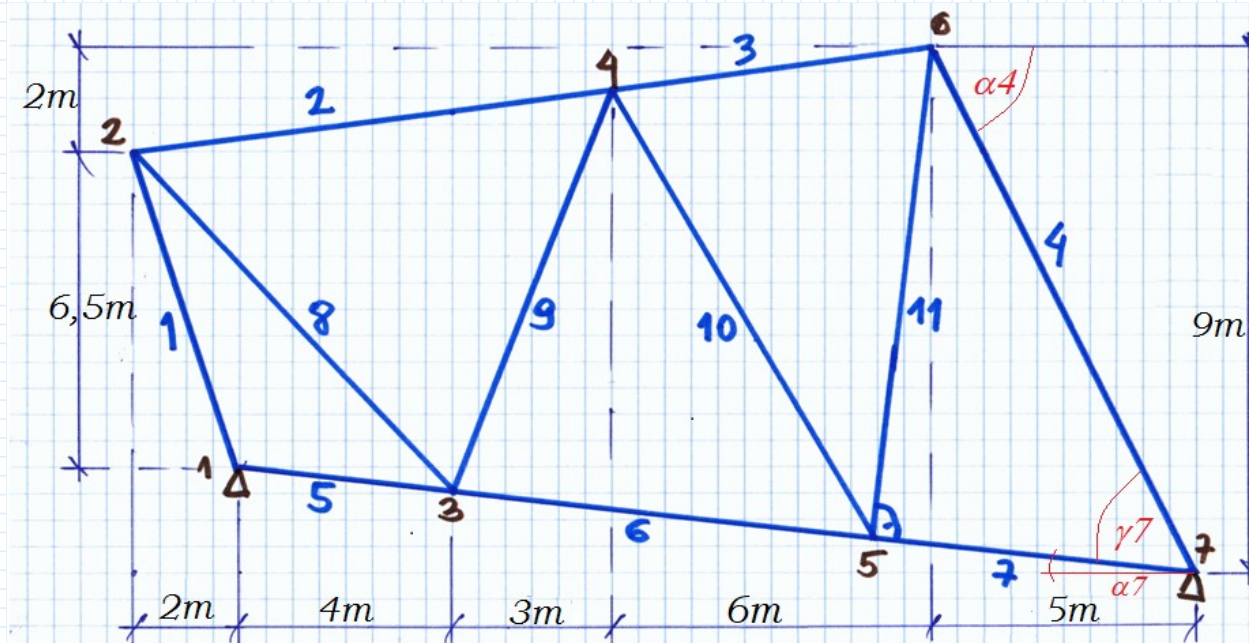
EA := 27 MN

Elementy: 3, 8, 9, 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 (3,8,9,10) kratownicy płaskiej.
Sładowe macierze podać z dokładnością do +/- 0.05 kN/m



$$\alpha 7 := \text{atan}\left(\frac{0.5}{18}\right) = 1.59114 \text{ deg}$$

$$\alpha 4 := \text{atan}\left(\frac{9}{5}\right) = 60.94540 \text{ deg}$$

$$\gamma 7 := \alpha 4 - \alpha 7 = 59.35426 \text{ deg}$$

$$l 4 := \sqrt{5^2 + 9^2} \text{ m} = 10.29563 \text{ m}$$

$$l 7 := l 4 \cdot \cos(\gamma 7) = 5.24798 \text{ m}$$

$$Y 5 := -0.5 \text{ m} + l 7 \cdot \sin(\alpha 7) = -0.354279 \text{ m}$$

$$X 5 := 18 \text{ m} - l 7 \cdot \cos(\alpha 7) = 12.75405 \text{ m}$$

Element "3"

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

$$Ly := 2 \text{ m} \cdot \frac{6}{15} = 0.80000 \text{ m}$$

$$\bar{L} := \sqrt{(Lx)^2 + (Ly)^2} = 6.053098 \text{ m}$$

$$J^3 = \begin{bmatrix} 4382.6 & 584.3 \\ 584.3 & 77.9 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "8"

$$Y3 := -0.5 \text{ m} \cdot \frac{4}{18} = -0.11111 \text{ m}$$

$$\bar{L}x := 6 \text{ m}$$

$$\bar{L}y := Y3 - 6.5 \text{ m} = -6.611111 \text{ m}$$

$$\bar{L} := \sqrt{(\bar{L}x)^2 + (\bar{L}y)^2} = 8.927866 \text{ m}$$

$$J^8 = \begin{bmatrix} 1365.9 & -1505.0 \\ -1505.0 & 1658.3 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

$$Y4 := 6.5 \text{ m} + 2 \text{ m} \cdot \frac{9}{15} = 7.70000 \text{ m}$$

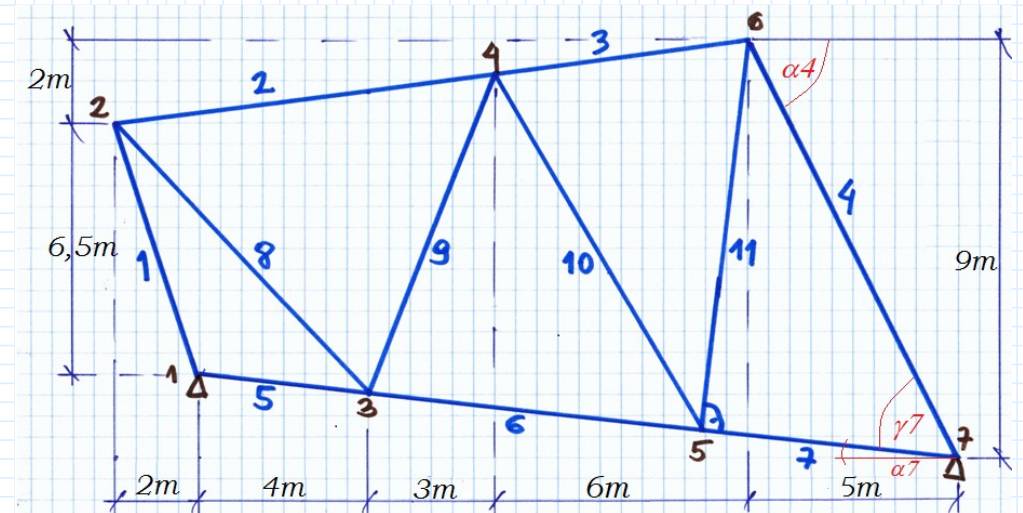
Element "9"

$$\bar{L}x := 3 \text{ m} = 3 \text{ m}$$

$$\bar{L}y := Y4 - Y3 = 7.811111 \text{ m}$$

$$\bar{L} := \sqrt{(\bar{L}x)^2 + (\bar{L}y)^2} = 8.367404 \text{ m}$$

$$J^9 = \begin{bmatrix} 414.8 & 1080 \\ 1080 & 2812 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$



Element "10"

$$Lx := X5 - 7 \text{ m} = 5.754048 \text{ m}$$

$$Ly := Y5 - Y4 = -8.054279 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 9.898509 \text{ m}$$

$$J^{10} = \begin{bmatrix} 921.7 & -1290.2 \\ -1290.2 & 1806 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

