

ORIGIN := 1

Elementy: 2, 7, 9, 10

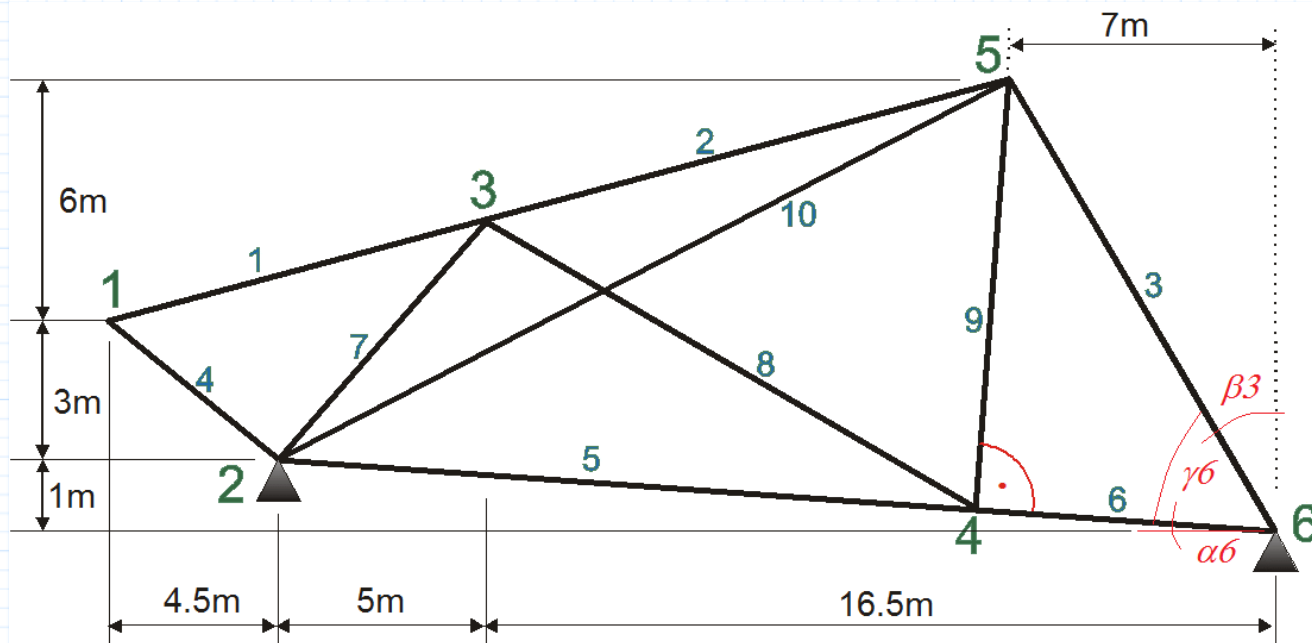
B

$EA := 31 \text{ MN}$

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

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

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



$$\alpha 6 := \text{atan}\left(\frac{1}{21.5}\right) = 2.663 \text{ deg}$$

$$\beta 3 := \text{atan}\left(\frac{7}{10}\right) = 34.99202 \text{ deg}$$

$$\gamma 6 := \frac{\pi}{2} - \alpha 6 - \beta 3 = 52.34498 \text{ deg}$$

$$l 3 := \sqrt{7^2 + 10^2} \text{ m} = 12.206556 \text{ m}$$

$$l 6 := l 3 \cdot \cos(\gamma 6) = 7.457055 \text{ m}$$

$$Y 3 := 10 \text{ m} - 6 \text{ m} \cdot \frac{9.5}{19} = 7.000000 \text{ m}$$

$$Y 4 := l 6 \cdot \sin(\alpha 6) = 0.346465 \text{ m}$$

$$X 4 := 21.5 \text{ m} - l 6 \cdot \cos(\alpha 6) = 14.050998 \text{ m}$$

Element "2"

$$Lx := 9.5 \text{ m} = 9.5 \text{ m}$$

$$Ly := 10 \text{ m} - Y3 = 3.00000 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 9.962429 \text{ m}$$

$$J^2 = \begin{bmatrix} 2829.5 & 893.5 \\ 893.5 & 282.2 \end{bmatrix} \frac{kN}{m}$$

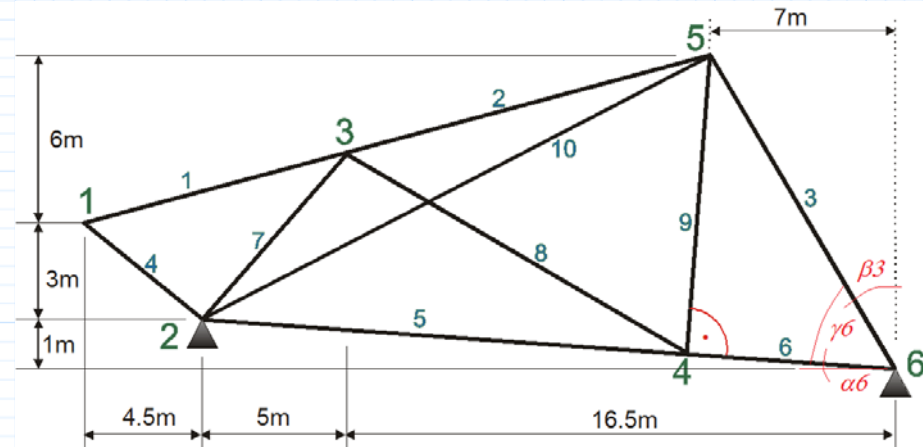
Element "7"

$$Lx := 5 \text{ m} = 5 \text{ m}$$

$$Ly := Y3 - 1 \text{ m} = 6 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 7.810250 \text{ m}$$

$$J^7 = \begin{bmatrix} 1626.7 & 1952.0 \\ 1952.0 & 2342.4 \end{bmatrix} \frac{kN}{m}$$



Element "9"

$$Lx := 14.5 \text{ m} - X4 = 0.449002 \text{ m}$$

$$Ly := 10 \text{ m} - Y4 = 9.653535 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 9.663971 \text{ m}$$

$$J^9 = \begin{bmatrix} 6.9 & 148.9 \\ 148.9 & 3200.9 \end{bmatrix} \frac{kN}{m}$$

Element "10"

$$Lx := 14.5 \text{ m} = 14.5 \text{ m}$$

$$Ly := 9 \text{ m} = 9 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 17.066048 \text{ m}$$

$$J^{10} = \begin{bmatrix} 1311.3 & 813.9 \\ 813.9 & 505.2 \end{bmatrix} \frac{kN}{m}$$