

ORIGIN := 1

BA

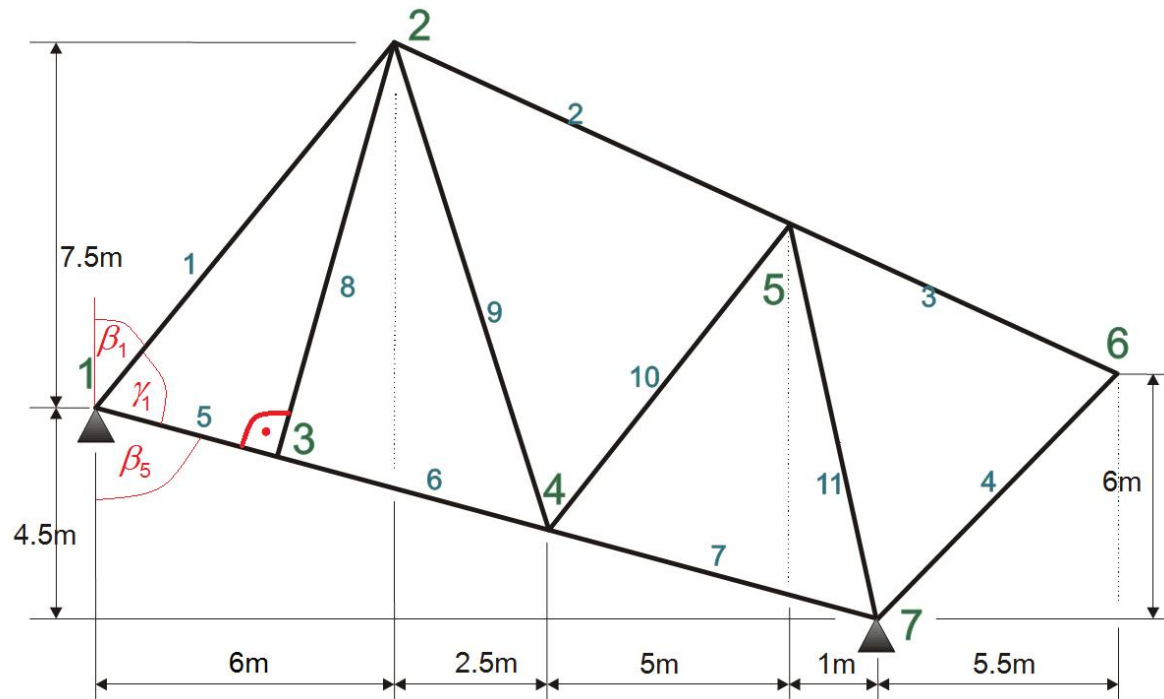
EA := 29 MN

Elementy: 2, 7, 8, 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



$$Y6 := 6 \text{ m} - 4.5 \text{ m} = 1.5 \text{ m}$$

$$\beta_1 := \text{atan}\left(\frac{6}{7.5}\right) = 38.65981 \text{ deg}$$

$$\beta_5 := \text{atan}\left(\frac{14.5}{4.5}\right) = 72.75854 \text{ deg}$$

$$\gamma_1 := \pi - \beta_1 - \beta_5 = 68.58165 \text{ deg}$$

$$l_1 := \sqrt{6^2 + (7.5)^2} \text{ m} = 9.604686 \text{ m}$$

$$l_5 := l_1 \cdot \cos(\gamma_1) = 3.507391 \text{ m}$$

$$X_3 := l_5 \cdot \sin(\beta_5) = 3.34978 \text{ m}$$

$$Y_3 := -l_5 \cdot \cos(\beta_5) = -1.03959 \text{ m}$$

$$X_2 := 6 \text{ m}$$

$$X_7 := 14.5 \text{ m}$$

$$X_4 := 8.5 \text{ m}$$

$$X_5 := 13.5 \text{ m}$$

$$Y_2 := 7.5 \text{ m}$$

$$Y_7 := -4.5 \text{ m}$$

$$Y_4 := Y_7 \cdot \frac{X_4}{X_7}$$

$$Y_5 := Y_6 + (Y_2 - Y_6) \frac{6.5}{14} = 4.28571 \text{ m}$$

Element "2"

$$Lx := 7.5 \text{ m} = 7.5 \text{ m}$$

$$Ly := Y5 - Y2 = -3.21429 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 8.159757 \text{ m}$$

$$J^2 = \begin{bmatrix} 3002.5 & -1286.8 \\ -1286.8 & 551.5 \end{bmatrix} \frac{kN}{m}$$

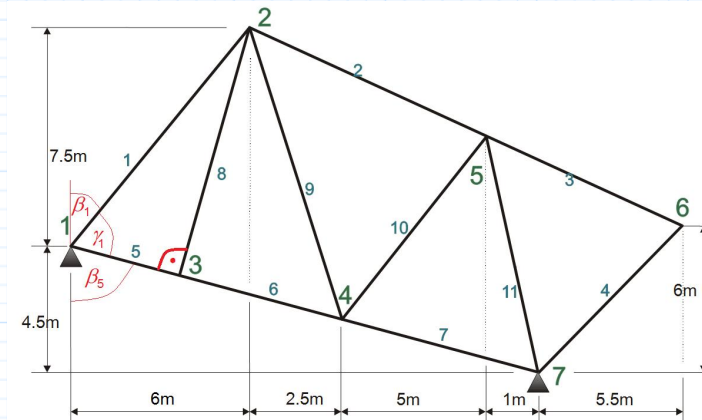
Element "7"

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

$$Ly := Y7 - Y4 = -1.862069 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 6.282301 \text{ m}$$

$$J^7 = \begin{bmatrix} 4210.6 & -1306.7 \\ -1306.7 & 405.5 \end{bmatrix} \frac{kN}{m}$$



Element "8"

$$Lx := X2 - X3 = 2.650217 \text{ m}$$

$$Ly := Y2 - Y3 = 8.539588 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 8.941376 \text{ m}$$

$$J^8 = \begin{bmatrix} 284.9 & 918.1 \\ 918.1 & 2958.4 \end{bmatrix} \frac{kN}{m}$$

Element "9"

$$Lx := X4 - X2 = 2.5 \text{ m}$$

$$Ly := Y4 - Y2 = -10.137931 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 10.441630 \text{ m}$$

$$J^9 = \begin{bmatrix} 159.2 & -645.6 \\ -645.6 & 2618.1 \end{bmatrix} \frac{kN}{m}$$

