

ORIGIN := 1

A2

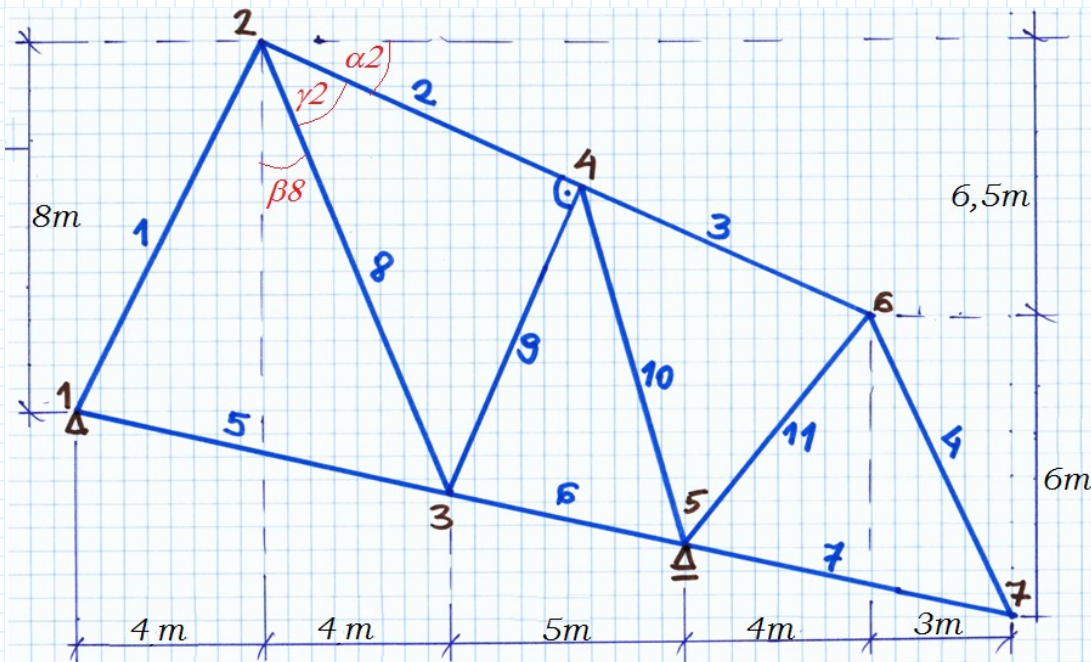
EA := 27 MN

Elementy: 2, 5, 8, 11

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

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

Wyznaczyć bloki **J** macierzy sztywności elementów (2,5,8,11) kratownicy płaskiej.
Sładowe macierze podać z dokładnością do +/- 0.05 kN/m



$$Y5 := -4.5 \text{ m} \cdot \frac{13}{20} = -2.925000 \text{ m}$$

$$Y4 := 8 \text{ m} - l2 \cdot \sin(\alpha2) = 4.440000 \text{ m}$$

$$Y3 := -4.5 \text{ m} \cdot \frac{8}{20} = -1.80000 \text{ m}$$

$$\alpha2 := \text{atan}\left(\frac{6.5}{13}\right) = 26.56505 \text{ deg}$$

$$\beta8 := \text{atan}\left(\frac{4}{8 - \frac{Y3}{m}}\right) = 22.20348 \text{ deg}$$

$$\gamma2 := \frac{\pi}{2} - (\alpha2 + \beta8) = 41.23147 \text{ deg}$$

$$l8 := \sqrt{4^2 + \left(8 - \frac{Y3}{m}\right)^2} \text{ m} = 10.584895 \text{ m}$$

$$l2 := l8 \cdot \cos(\gamma2) = 7.960402 \text{ m}$$

$$X4 := 4 \text{ m} + l2 \cdot \cos(\alpha2) = 11.12000 \text{ m}$$

Element "2"

$$Lx := X4 - 4 \text{ m} = 7.12000 \text{ m}$$

$$Ly := Y4 - 8 \text{ m} = -3.56000 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 7.960402 \text{ m}$$

$$J^2 = \begin{bmatrix} 2713.4 & -1356.7 \\ -1356.7 & 678.4 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

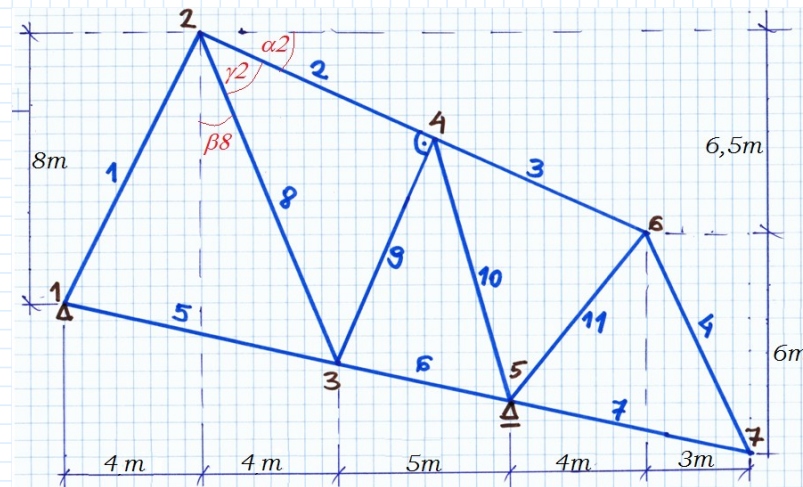
Element "5"

$$Lx := 8 \text{ m}$$

$$Ly := Y3 - 1.800000 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 8.200000 \text{ m}$$

$$J^5 = \begin{bmatrix} 3134.0 & -705.2 \\ -705.2 & 158.7 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$



Element "8"

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

$$Ly := Y3 - 8 \text{ m} = -9.8 \text{ m}$$

$$L := \sqrt{(Lx)^2 + (Ly)^2} = 10.584895 \text{ m}$$

$$J^8 = \begin{bmatrix} 364.3 & -892.5 \\ -892.5 & 2186.5 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "11"

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

$$\boxed{Ly} := (8 - 6.5) \text{ m} - Y5 = 4.425000 \text{ m}$$

$$\boxed{L} := \sqrt{(Lx)^2 + (Ly)^2} = 5.964950 \text{ m}$$

$$J^{11} = \begin{bmatrix} 2035.5 & 2251.7 \\ 2251.7 & 2491 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

