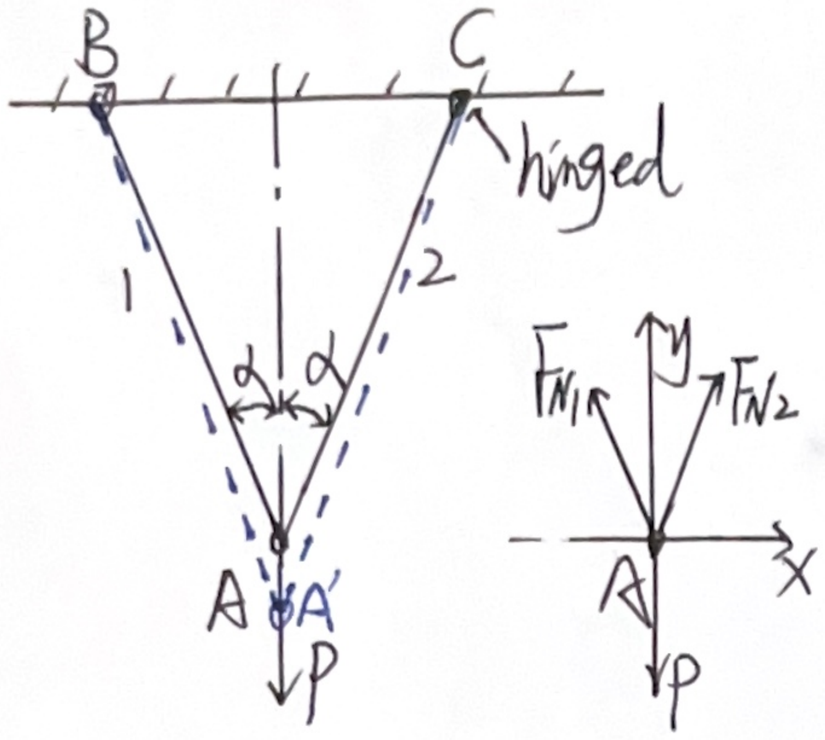


$\alpha = 30°$, $l = 200mm$, $d = 25mm$

↑ Rod width ↓ Rod diameter

Rod material : steel.

$E = 210\ GPa$ Poisson's ratio : 0.3

$P = 100\ KN$

Get the displacement of node A (ΔA)

Solution: $\Sigma F_x = 0 \Rightarrow F_{N2}\sin\alpha - F_{N1}\sin\alpha = 0$

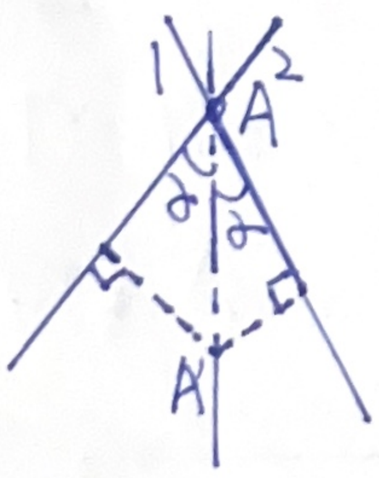
$\Sigma F_y = 0 \Rightarrow F_{N1}\cos\alpha + F_{N2}\cos\alpha - P = 0$

$$\Rightarrow F_{N1} = F_{N2} = \frac{P}{2\cos\alpha}$$

Hooke's law : $\varepsilon = \sigma / E$

$$\Rightarrow \Delta l_1 = \Delta l_2 = \frac{F_{N1} l}{EA} = \frac{Pl}{2EA\cos\alpha}$$, $A = \pi(\frac{d}{2})^2$ is the cross-sectional area

To get the ΔA, we have to use Infinitesimal strain theory



$$\Delta A = AA' \approx \frac{\Delta l_1}{\cos\alpha}$$

$$= \frac{Pl}{2EA\cos^2\alpha} \approx 0.12934\ mm$$