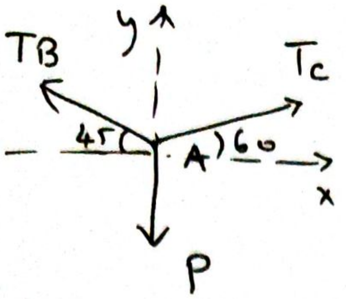
Exo1:



$\sum \vec{F_i} = \vec{0}$

$\vec{P} + \vec{T_C} + \vec{T_B} = \vec{0}$

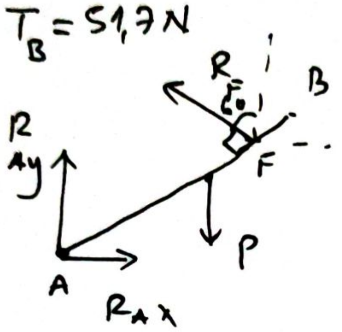
Par Projection :

$T_C \cos 60 - T_B \cos 45 = 0$ — (1)

$T_C \sin 60 + T_B \sin 45 - P = 0$ — (2)

$T_C = 73{,}2\,N$ et $T_B = 51{,}7\,N$

Exo2:



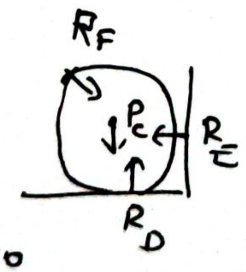
1) on isole la barre

$$\sum \vec{F_i} = \vec{0} \begin{cases} ox: R_{Ax} - R_F \sin 60 = 0 & \text{— (1)} \\ oy: R_{Ay} - P + R_F \cos 60 & \text{— (2)} \end{cases}$$

$\sum M_{/A}(\vec{F_i}) = 0 \Rightarrow -PL\cos 60 + R_F b = 0$

$R_F = \dfrac{PL\cos 60}{b}$, $R_{Ax} = \dfrac{PL \cos 60 \sin 60}{b}$

$R_{Ay} = P + \dfrac{PL\cos^2 60}{b}$

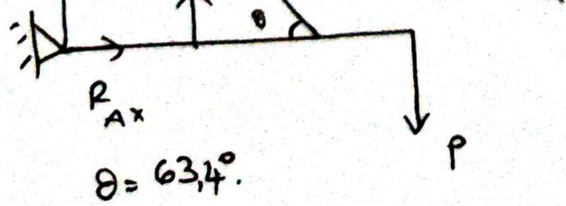


2) on isole le cylindre

$$\sum \vec{F_i} = \vec{0} \begin{cases} ox: R_F \cos 30 - R_E = 0 \\ oy: -P_c + R_D - R_F \sin 30 = 0 \end{cases}$$

donc $R_E = R_F \cos 30$ et $R_D = P_c + R_F \sin 30$

Exo3:



$\theta = 63{,}4°$.

$$\sum \vec{F_i} = \vec{0} \Leftrightarrow \begin{cases} ox: R_{Ax} - T_c \cos\theta = 0 & \text{— (1)} \\ oy: R_{Ay} + T_B + T_c \sin\theta - P = 0 & \text{— (2)} \end{cases}$$

Sachant que $T_B = T_C$

$\sum M_{/A}(\vec{F_i}) = \vec{0}$

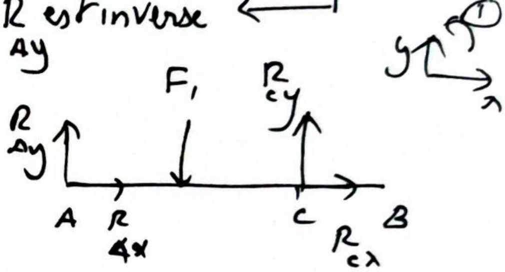
$T_B \cdot 1{,}5 + T_c \sin\theta \times 3 - P \times 4 = 0$

$\boxed{T_B = T_C = 344{,}5\,N}$

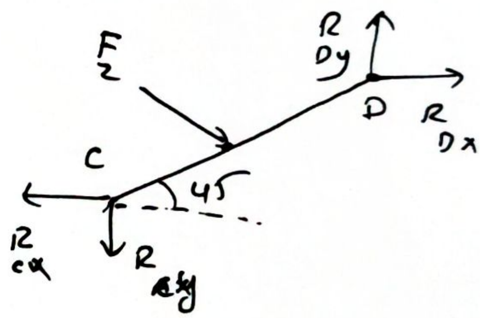
$R_{Ax} = 154{,}2\,N$ et $R_{Ay} = -292{,}5\,N$

Le sens de R_{Ay} est inversé

Exo4:



Système (1):



Système (2):

$$\text{Système 1: } \begin{cases} ox: R_{Ax} + R_{cx} = 0 & \text{— (1)} \\ oy: R_{Ay} - F_1 + R_{cy} = 0 & \text{— (2)} \end{cases}$$

$\sum M_{/A}(\vec{F_i}) = 0$ $R_{cy} \cdot 50 - F_1 \cdot 20 = 0$ — (3)

donc $R_{cy} = 600\,N$ et $R_{Ay} = 900\,N$

$$\text{Système 2: } \begin{cases} ox: -R_{cx} + R_{Dx} + F_2 \cos 45 = 0 & \text{— (4)} \\ oy: -R_{cy} + R_{Dy} - F_2 \sin 45 = 0 & \text{— (5)} \end{cases}$$

$\sum M_{/D}(\vec{F_i}) = 0$

$F_2 \cdot 40 - R_{cx} 60 \cdot \sin 45 + R_{cy} 60 \cdot \cos 45 = 0$ — (6)

$R_{cx} = 1731{,}3\,N$, de (4): $R_{Dx} = 882{,}84\,N$

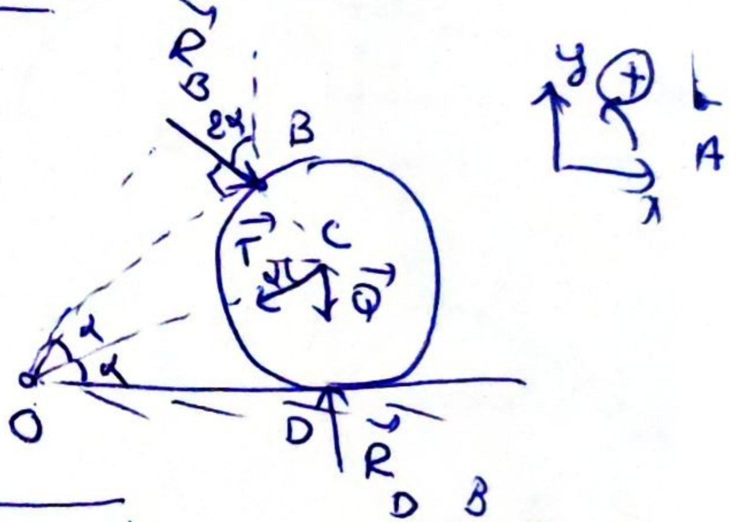
et de (5): $R_{Dy} = 1448{,}5\,N$.

Exo6 :

• **En isolant le cylindre :**

D'après les deux triangles OCD et OBC :

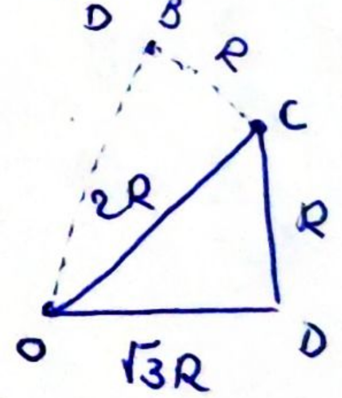
$$\sin\alpha = \frac{R}{2R} \Rightarrow \alpha = 30°$$



$$\sum \vec{F}_i = \vec{0} \quad \vec{Q} + \vec{R}_B + \vec{T} + \vec{R}_D = \vec{0}$$

Par projection : $ox = R_B \sin 60 - T\cos 30 = 0 \Rightarrow \boxed{R_B = T}$ —(1)

$oy : -Q + R_D - R_B \cos 60 - T \sin 30 = 0$ —(2)



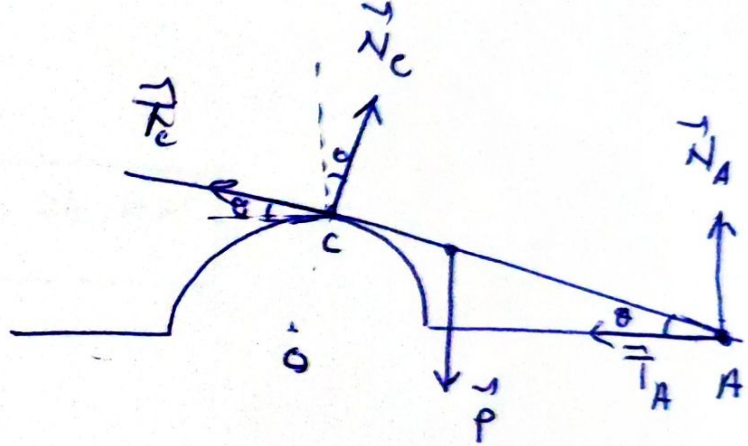
$$\sum \vec{M}_{/O}(\vec{F}_i) = \vec{0} \Leftrightarrow M_{/O}(\vec{Q}) + M_{/O}(\vec{R}_D) + \cancel{M_{/O}(\vec{T})} + M_{/O}(\vec{R}_B) = \vec{0}$$

O

$$\sum \vec{M}_O(\vec{F}_i) = 0 \Leftrightarrow -Q\cdot\sqrt{3}R + R_D\cdot\sqrt{3}R - R_B\cdot\sqrt{3}R = 0 \quad —(3)$$

$$\boxed{R_D - Q = R_B}$$

Exo 7:



$\sum \vec{F}_i = \vec{0}$

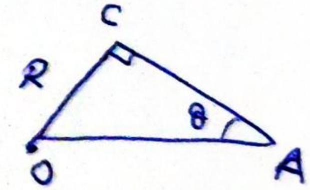
$ox: -T_A - T_c\cos\theta + N_c\sin\theta = 0$ — (1)

$oy: -P + N_A + N_c\cos\theta + T_c\sin\theta = 0$ — (2)

$T_A = \mu N_A \ , \ T_c = \mu N_c$

$-\mu N_A - \mu N_c\cos\theta + N_c\sin\theta = 0$ — (1)'

$-P + N_A + N_c\cos\theta + \mu N_c\sin\theta = 0$ — (2)'



$tg\theta = \frac{R}{AC}$

$AC = \frac{R}{tg\theta}$

$\sum M_{/A}(\vec{F}_i) = 0 \Leftrightarrow P\frac{L}{2} - N_c R \frac{\cos\theta}{\sin\theta} = 0$

$P\frac{L}{2}\cos\theta - N_c R\, AC = 0$

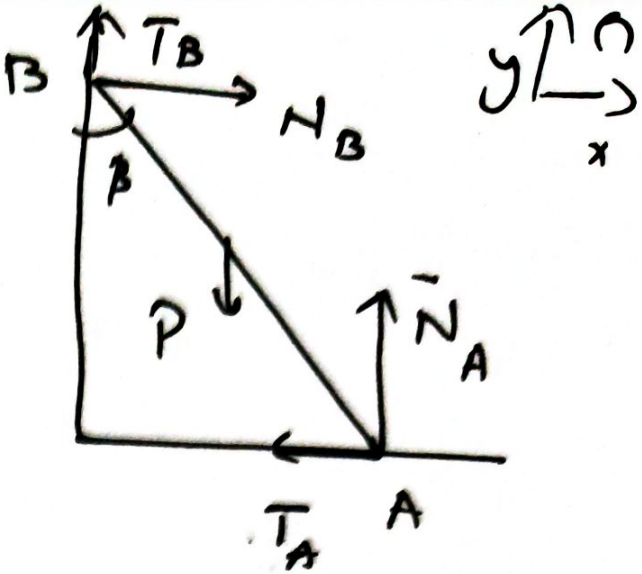
$P\frac{L}{2} - N_c R . \frac{1}{\sin\theta} = 0 \Rightarrow N_c = \frac{LP\sin\theta}{2R}$ — (3)

(3) dans (2)' : $-\mu N_A - \mu \frac{P}{2RL}\sin\theta\cos\theta + \frac{P}{2RL}\sin^2\theta = 0$ — (5)

(3) dans (2)' : $-P + N_A + \frac{P}{2RL}\sin\theta\cos\theta + \frac{P\mu}{2RL}\sin^2\theta = 0$ — (6)

$\mu \times (6) + (5)$: $\sin\theta = \sqrt{\frac{2\mu RL}{1+\mu^2}}$, $\boxed{\theta = 20^\circ}$

Exo 7 :



$$\sum \vec{F}_i = 0 \begin{cases} ox : -T_A + N_B = 0 & -(1) \\ oy : -P + N_A + T_B = 0 & -(2) \end{cases}$$

$T_A = \mu N_A$ et $T_B = \mu N_B$

donc $N_B = \mu N_A$ et $N_A = \dfrac{P}{1+\mu^2}$

$N_A = 96{,}1\,N$ et $N_B = 19{,}2\,N$

$T_A = 19{,}23\,N$ et $T_B = 3{,}84\,N$

$$\sum M_{/A}(\vec{F_i}) = 0 \Leftrightarrow P\frac{L}{2}\sin\beta - N_B L\cos\beta - T_B L\sin\beta = 0$$

$$\boxed{\beta = 22{,}6^\circ}$$