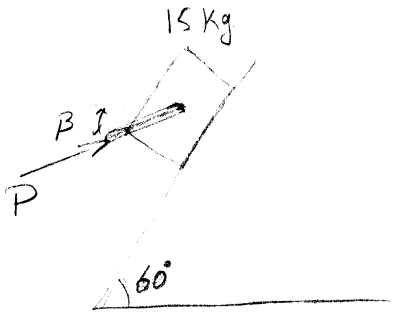
GNG 1505 Semaine 10 (14 - 20 Novembre).

Solutions des exercices suggérés
(8.8 ; 8.14 ; 8.19 ; 8.32 ; 8.36 ; 8.68).

8.8 :



Données :

$\mu_s = 0.25$

Trouver :

a) P_{min} pour l'équilibre ?

b) β ??

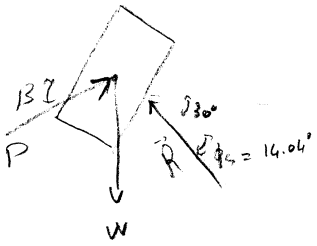
$|\vec{W}| = (15\,kg)(9.81\,m/s^2) = 147.15\,N$

Solutions :

SCI :

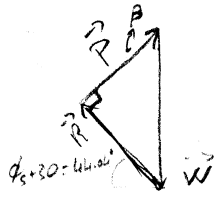
$\mu_s = 0.25 \Rightarrow \tan\phi_s = 0.25$

$\phi_s = 14.04°$



Triangle des forces :

* on connait la grandeur et la direction du poids $\vec{W}$.
* on connait la direction de $\vec{R}$



D'après le triangle des forces.

P_{min} est $\perp$ à $\vec{R}$.

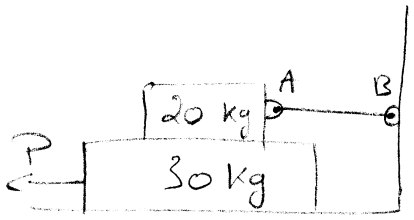
Or $P_{min} = W \sin(45.96) = \boxed{105.8\,N}$ $\qquad \boxed{\beta = 45.96°}$

8.14:

Donnée:

$\mu_s = 0.4$

$\mu_k = 0.3$

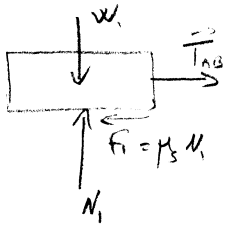


Trouver:

a) force P requise pour le mouvement

b) force P si le cable AB est retiré

a) SCI: le bloc de 20 kg



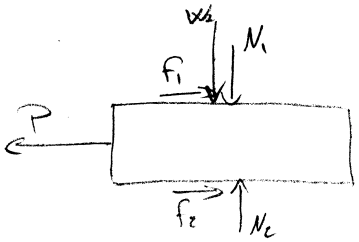
$W = 20 \times 9.81 = 196.2\ N$

$\Sigma f_y = 0 \Rightarrow W = N_1 = 196.2\ N$

$\Sigma f_x = 0 \Rightarrow T - f_1 = 0 \Rightarrow T = f_1 = 0.4 N_1$

$\Rightarrow \boxed{T = f_1 = 78.48\ N}$

SCI: le bloc de 30 kg



$W_2 = 30 \times 9.81 = 294.3\ N$

$\Sigma f_y = 0 \Rightarrow N_2 = W_2 + N_1$

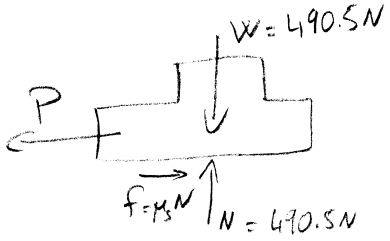
$N_2 = 490.5\ N$

$\Sigma f_x = 0 \Rightarrow P = f_1 + f_2$

$\Rightarrow P = 78.48 + 0.4(490.5)$

$\boxed{P = 274.7\ N \leftarrow}$

b) SCI: les 2 blocs



$\rightarrow \Sigma f_x = 0 \quad P - f = 0$

$P = f = \mu_s N = 0.4(490.5)$

$\boxed{P = 196.2\ N \leftarrow}$

8.19:

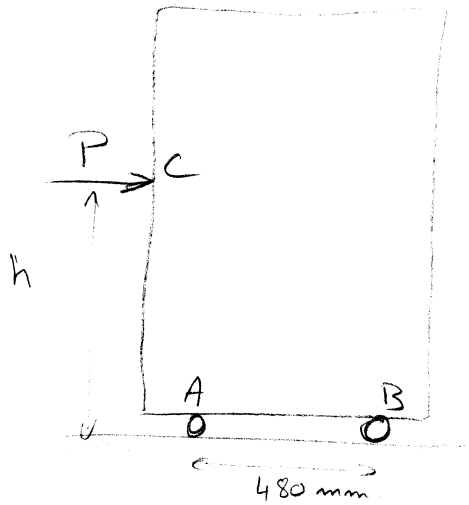
Donnée:

$m = 61.2\ kg$

$\Rightarrow W = 61.2 \times 9.81 = 600\ N$

$h = 640\ mm$

$\mu_s = 0.3$



Trouver:

force P requise pour le mouvement

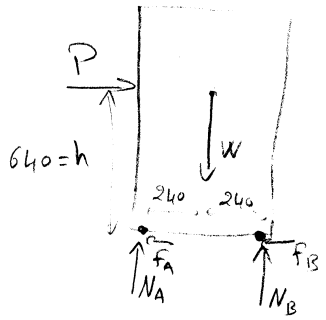
a) Toutes les roulettes sont bloquées

b) Roulettes en B bloquées

c) Roulettes en A bloquées

a)

SCI:



$+\uparrow \Sigma f_y = 0$:

$N_A + N_B - W = 0 \Rightarrow N_A + N_B = W = 600N.$

$f_A + f_B = \mu_s N_A + \mu_s N_B = \mu_s (N_A + N_B)$

$= 0.3(600) = 180N$

$\xrightarrow{+} \Sigma f_x = 0 \quad P - f_A - f_B = 0$

$P = f_A + f_B = \boxed{180N \rightarrow}$

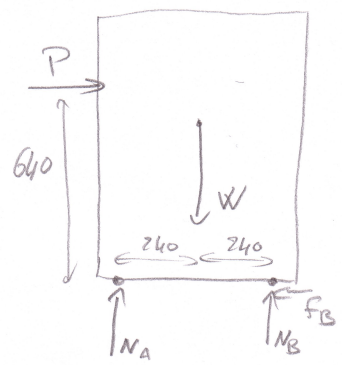
Check si l'armoire va pencher.

$+) \Sigma M_B = 0 \Rightarrow (600)(240) - (180)(640) - N_A(480) = 0.$

$\Rightarrow N_A = +60N > 0 \checkmark$ OK.

b)

SCI:



$\xrightarrow{+} \Sigma f_x = 0 \Rightarrow P = f_B = \mu_s N_B$. (1).

$\circlearrowleft + \Sigma M_A = 0$

$-P(640) - (600)(240) + N_B(480) = 0$

$-0.3 N_B (640) + N_B (480) = (600)(240)$

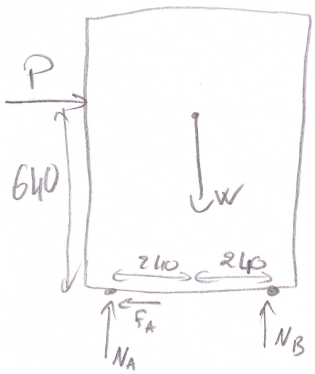
$288 N_B = (600)(240)$

$\boxed{N_B = 500N}$

(1) $\Rightarrow P = 0.3 \times 500 = \boxed{150N \rightarrow}$

c)

SCI:



$f_A = \mu_s N_A = 0.3 N_A$.

$\xrightarrow{+} \Sigma f_x = 0 \therefore P = f_A = 0.3 N_A$. (2)

$\circlearrowleft + \Sigma M_B = 0$

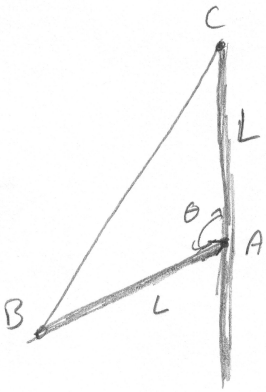
$-P(640) + (600)(240) - N_A(480) = 0$.

$-0.3 N_A (640) - N_A (480) = -(600)(240)$.

$\boxed{N_A = 214.29N}$.

(2) $\Rightarrow P = 0.3 \times 214.29 = \boxed{64.3N \rightarrow}$.

8.32:



Donnée:

$\mu_s = 0.4$

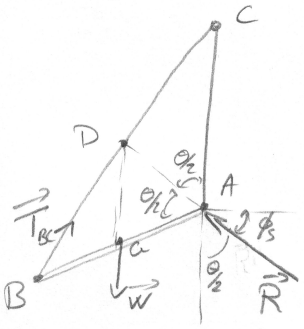
$\mu_K = 0.3$

Trouver:

a) Valeur de θ pour un mouvement imminent

b) T_{BC} ?

Solution:



Un corps à 3 forces:

la ligne d'action de $\vec{R}$ doit passer par D point d'intersection de $\vec{W}$ avec $\vec{T}_{BC}$.

$\tan \phi_s = \mu_s = 0.4$

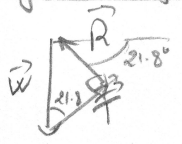
$\boxed{\phi_s = 21.8°}$

a) on a $BG = GA$ alors $BD = DC \Rightarrow$ D milieu de BC

alors AD est la bissectrice de l'angle θ.

$\therefore \frac{\theta}{2} + \phi_s = 90° \; ; \; \frac{\theta}{2} + 21.8 = 90 \Rightarrow \boxed{\theta = 136.4°}$

b) triangle des forces:



$T = W \cos(21.8)$

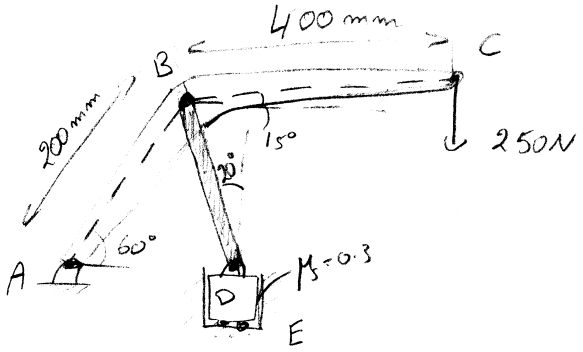
$\boxed{T = 0.928\, W}$.

8.36:

Donnée:

entre le poinçon D et le guide E

$\mu_s = 0.3$

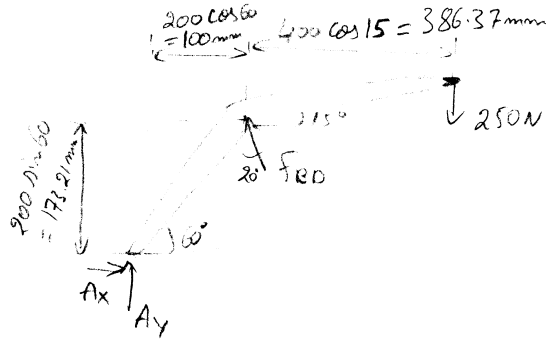


Trouver:

Force exercée par D sur le sean.

Solution:

SCI: membrure AC

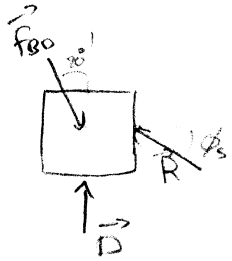


$+\circlearrowleft \Sigma M_A = 0$

$\Rightarrow F_{BD}\cos 20\,(100) + F_{BD}\sin 20\,(173.21) - 250\,(100 + 386.37) = 0$

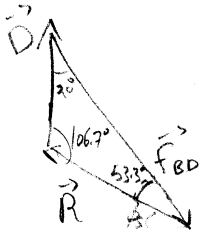
$\Rightarrow \boxed{F_{BD} = 793.6\,N}$

SCI: poinçon D:



$\tan \phi_s = \mu_s = 0.3 \Rightarrow \boxed{\phi_s = 16.7°}$

le triangle des forces:



Appliquons la loi de sinus

$$\frac{D}{\sin 53.3°} = \frac{793.6\,N}{\sin 106.7°}$$

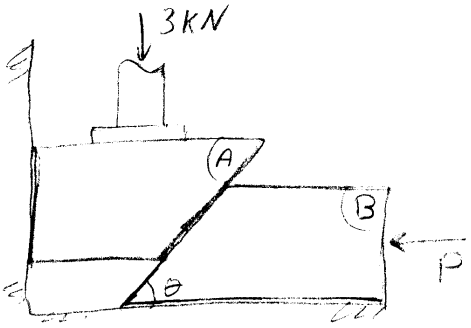
$\boxed{D = 664.3\,N}$

8.68:

Donnée:

$\mu_s = 0.25$

$\theta = 45°$



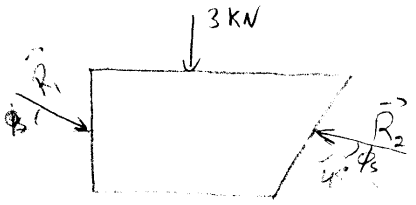
Trouver:

P minimale pour lever le bloc A

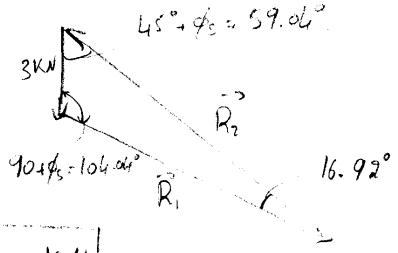
Solution:

SCI: bloc A:

$\tan \phi_s = \mu_s = 0.25 \Rightarrow \phi_s = 14.04°$



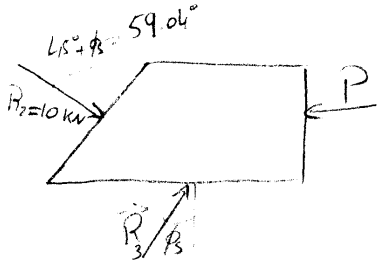
triangle des forces:



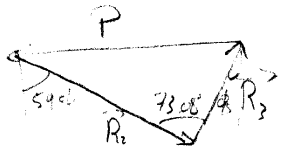
Loi de sinus:

$$\frac{R_2}{\sin 104.04°} = \frac{3\,KN}{\sin 16.92°} \Rightarrow \boxed{R_2 = 10.00\,KN}$$

SCI: bloc B:



triangle des forces:



Loi de sinus:

$$\frac{P}{\sin 73.08°} = \frac{10\,KN}{\sin 75.96} \Rightarrow \boxed{P = 9.86\,KN}$$