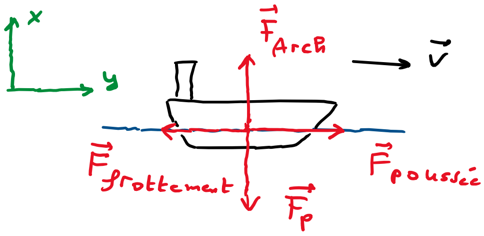
4.40 $v = \text{constante} \Rightarrow$ la 1ère loi de Newton s'applique : $(\Sigma \vec{F}_{ext})_x = 0$
$(\Sigma \vec{F}_{ext})_y = 0$

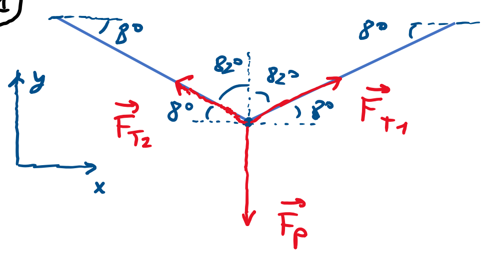
(a). $(\Sigma \vec{F}_{ext})_x = F_{poussée} - F_{frottement} = 0$



$\Rightarrow F_{frottement} = \underline{\underline{7{,}40 \cdot 10^5\ N}}$

(b). $(\Sigma \vec{F}_{ext})_y = F_{Archimède} - F_{pesanteur} = 0$ $\Rightarrow F_{Archimède} = m \cdot g = 1{,}70 \cdot 10^8 \cdot 9{,}81$
$= \underline{\underline{1{,}67 \cdot 10^9\ N}}$

4.41



On applique la 1ère loi :

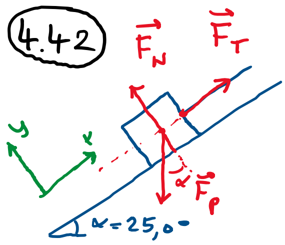
$(\Sigma \vec{F}_{ext})_y = F_{T_1} \cos 82° + F_{T_2} \cos 82° - F_p = 0$

$F_{T_1} = F_{T_2} = F_T = 2200\ N$

$\Rightarrow F_p = 2 F_T \cos 82° = 2 \cdot 2200 \cdot \cos 82° \cong 612\ N$

$\Rightarrow m = \frac{F_p}{g} \cong \underline{\underline{62\ kg}}$

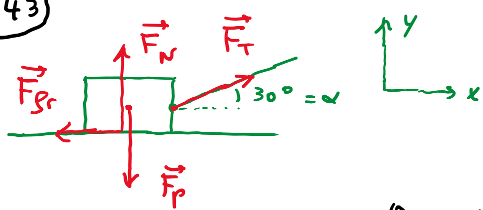
4.42



<u>On applique la 1ère loi :</u>

$(\Sigma \vec{F}_{ext})_x = F_T - F_p \sin\alpha$ $\Rightarrow F_T = F_p \sin\alpha = mg \sin\alpha = \underline{\underline{3{,}40 \cdot 10^2\ N}}$

4.43



<u>On applique la 1ère loi :</u>

- $(\Sigma \vec{F}_{ext})_x = F_T \cos 30 - F_{fr} = 0$

$\Rightarrow F_{fr} = F_T \cos 30°$ (1)

On sait que $F_{fr} = \mu_c F_N$ (2) $\Rightarrow$ On utilise aussi $(\Sigma \vec{F}_{ext})_y = 0$

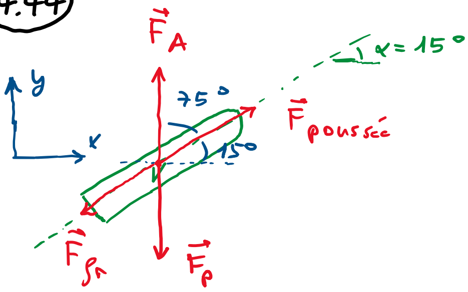
$(\Sigma \vec{F}_{ext})_y = F_N + F_T \sin 30° - F_p = 0 \Rightarrow F_N = F_p - F_T \sin 30°$ (3)

On combine (1), (2) et (3) : $\mu_c F_N = F_T \cos 30° = F_{fr}$

$$\Rightarrow \mu_c = \frac{F_T \cos 30°}{F_N} = \frac{F_T \cos 30°}{F_p - F_T \sin 30°} = \frac{80 \cdot \cos 30}{20 \cdot 9{,}81 - 80 \cdot \sin 30°}$$

$\cong \underline{\underline{0{,}44}}$

4.44



On applique la 1ère loi de Newton :

$$(\Sigma \vec{F}_{ext})_x = F_{poussée} \cos 15° - F_{fr} \cos 15° = 0$$

$$\Rightarrow F_{fr} = \frac{F_{poussée} \cdot \cancel{\cos 15°}}{\cancel{\cos 15°}} = \underline{\underline{2{,}10 \cdot 10^5\,N}}$$

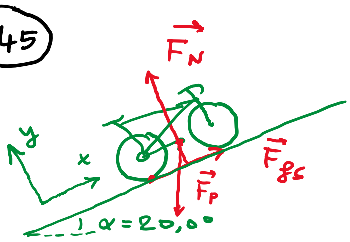
$$(\Sigma \vec{F}_{ext})_y = F_A + F_{poussée} \cdot \cos 75° - F_p - F_{fr} \cdot \cos 75° = 0$$

identiques !

$$\Rightarrow F_A = F_p + \cancel{F_{fr} \cos 75°} - \cancel{F_{poussée} \cdot \cos 75°} = \underline{\underline{1{,}57 \cdot 10^7\,N}}$$

$$F_p = mg = 1{,}6 \cdot 10^6 \cdot 9{,}81$$

4.45



On applique la 1ère loi de Newton !

$$(\Sigma \vec{F}_{ext})_x = F_{fs} - F_p \cos 70° = 0$$

$$\Rightarrow F_{fs} = F_p \cos 70° = 75{,}0 \cdot 9{,}81 \cdot \cos 70° \cong \underline{\underline{2{,}52 \cdot 10^2\,N}}$$