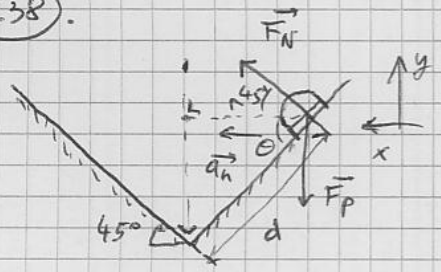
5.38



• 2ème loi de Newton : $\Sigma \vec{F} = \vec{F_N} + \vec{F_p} = m\vec{a_n}$

sur x : $F_N \cos 45° = m a_n$

$\left.\begin{array}{l} \bullet\ a_n = \dfrac{v^2}{r} \\ \bullet\ r = d\cos\theta \end{array}\right\} \Rightarrow a_n = \dfrac{v^2}{d\cos\theta}$ $\quad (\theta = 45°)$

$\Rightarrow F_N \cos 45° = m \dfrac{v^2}{d\cos\theta}$ (1)

sur y :

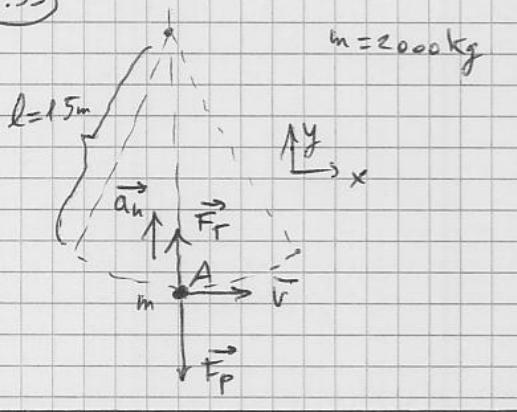
$F_N \cos\theta - mg = 0$

$F_N \cos 45 = mg$ (2)

Calcul de d : (1) et (2) : $mg = m\dfrac{v^2}{d\cos\theta} \Rightarrow d\cos\theta = \dfrac{v^2}{g} \Rightarrow d = \dfrac{v^2}{g\cos\theta}$

$d = \dfrac{27^2 \cdot 2}{9{,}81 \cdot \sqrt{2}} = \underline{4{,}1 \cdot 10^2\ m}$

5.39



• 2ème loi de Newton au point A : $\Sigma \vec{F} = \vec{F_T} + \vec{F_p} = m\vec{a}$

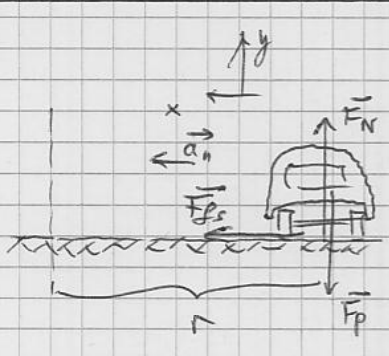
sur x : rien !

sur y : $F_T - mg = m a_n$

$\Rightarrow F_T = m(g + a_n) = m\left(g + \dfrac{v^2}{l}\right) = 2000 \cdot \left(9{,}81 + \dfrac{7{,}5^2}{15}\right)$

$= \underline{2{,}7 \cdot 10^4\ N}$

5.40



1er virage : 2ème loi : $\Sigma \vec{F} = \vec{F_N} + \vec{F_{fs}} + \vec{F_p} = m\vec{a_n}$

• sur x : $F_{fs} = m a_n = m\dfrac{v^2}{r}$ (1)

• sur y : $F_N - F_p = 0 \Rightarrow F_N = mg$

• Frottement : $F_{fs} = \mu_s F_N = \mu_s mg$ (2)

En combinant (1) et (2) : $\mu_s = \dfrac{v^2}{rg} = \dfrac{25^2}{75 \cdot 9{,}81}$

2ème virage : $\Sigma \vec{F} = \vec{F_N} + \vec{F_p} + \vec{F_{fs}} = m\vec{a_n}$

En utilisant les mêmes équations, on obtient $v^2 = \mu_s r g = \dfrac{25^2}{75 \cdot 9{,}81} \cdot 125 \cdot 9{,}81$

$\Rightarrow \underline{v = 30\ m/s}$