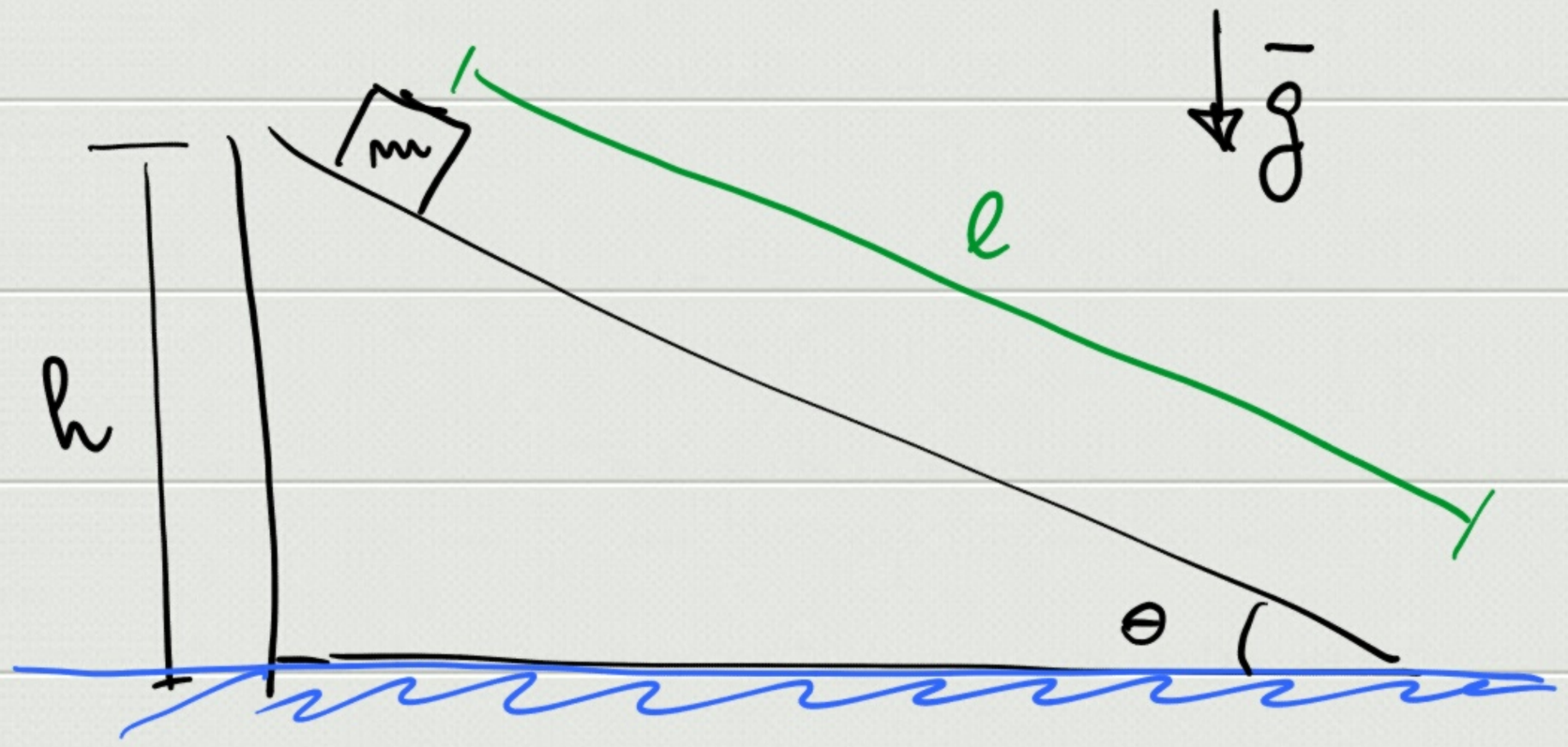
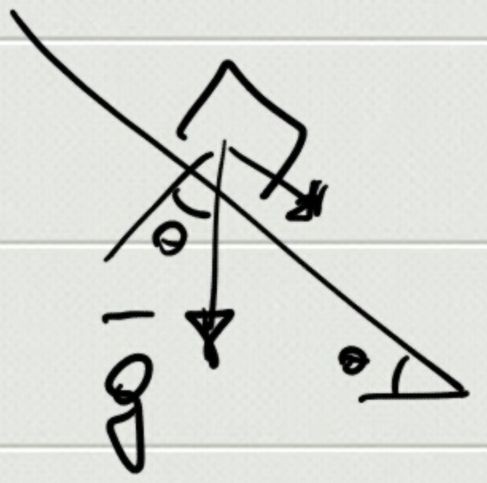


$m = 10\ kg$

$h = 0.5\ m$

$v_0 = 0$

$v_f = ?$ t $(\theta = 30°, 60°)$



- $v^2 = 2g\sin\theta \cdot \ell$ *

$v_f^2 = v_i^2 + 2a\Delta x$

- $\begin{cases} \ell = \frac{1}{2} g \sin\theta \cdot t^2 \\ v = g\sin\theta \cdot t \end{cases}$ *

- ~~$\ell = vt$~~

- $mgh = \frac{1}{2} m v^2$ *

$W_{peso} = -\Delta E_{p,peso} = \Delta E_k$

$-(mgz_f - mgz_i)$

$z_f \to 0$, $z_i \to h$

$$t = \sqrt{\frac{2\ell}{g\sin\theta}} = \sqrt{\frac{2h}{g\sin^2\theta}}$$

$h = \ell \sin\theta$

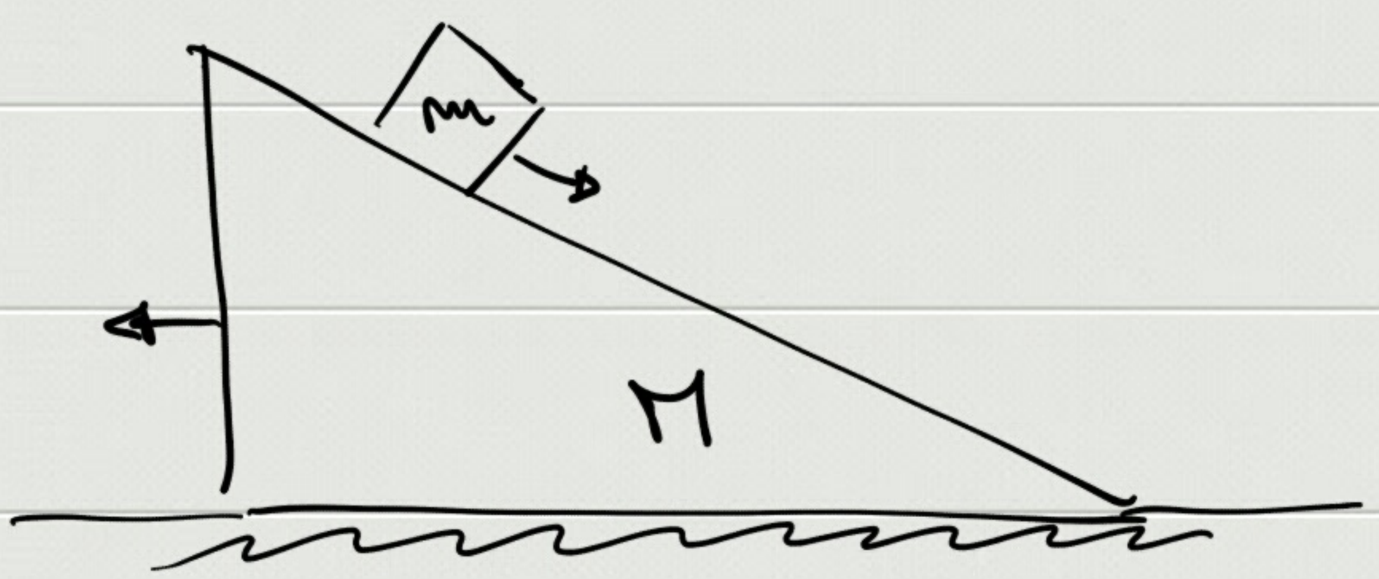
$\ell = \frac{h}{\sin\theta}$

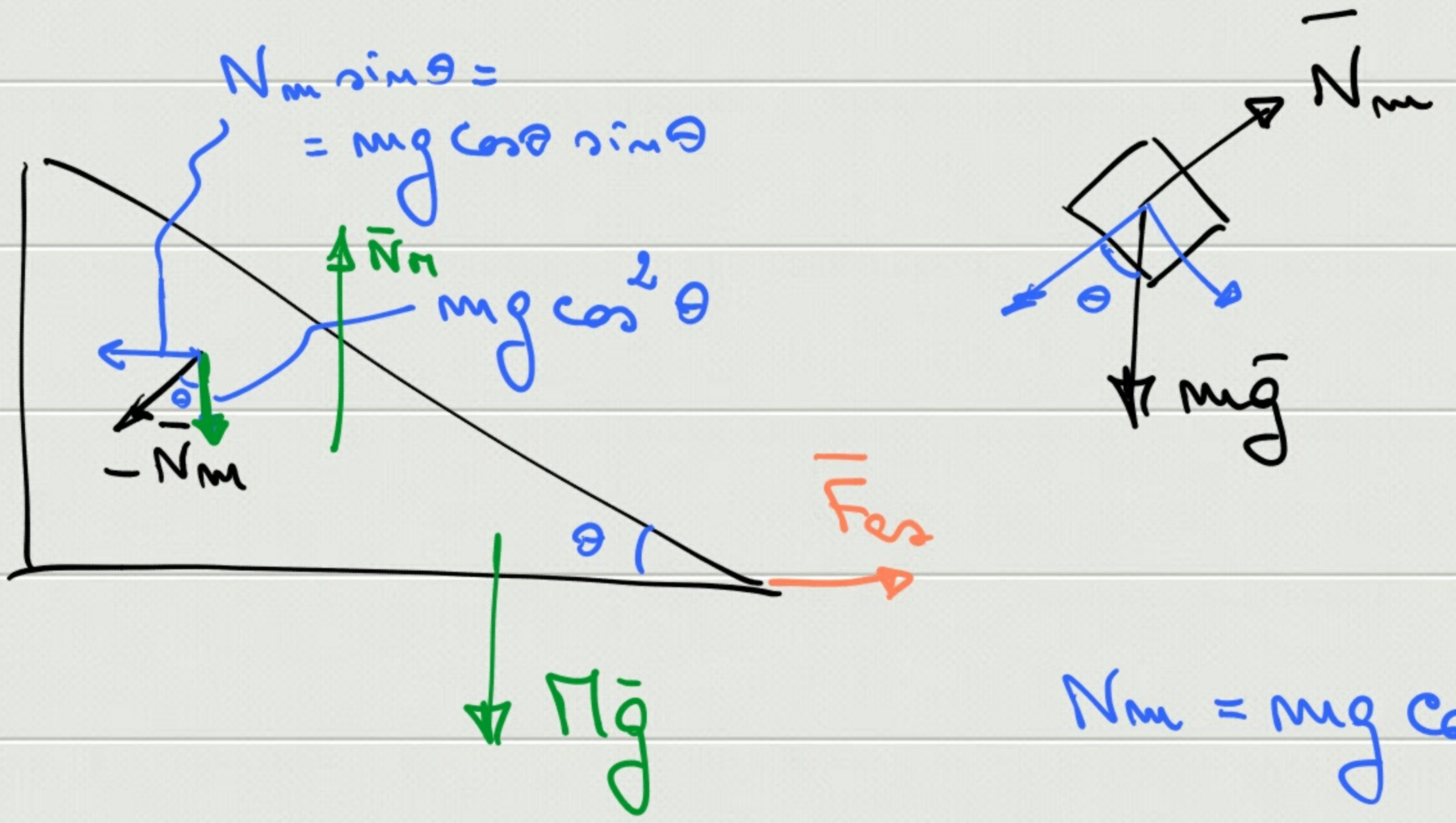
$t\ (\theta = 30°) = 0.41\ s$

$t\ (\theta = 60°) = 0.14\ s$

$$v = g\sin\theta \cdot t = g\sin\theta\sqrt{\frac{2h}{g\sin^2\theta}} = \sqrt{2gh}$$

$$= 3.13\ m/s$$





$$N_m = mg\cos\theta$$

$$N_M = Mg + mg\cos^2\theta$$

$$F_{es} = mg\sin\theta\cos\theta \le F_{es,max} = \mu_s N_M =$$

$$= \mu_s\left(M + m\cos^2\theta\right)g$$

$$\Rightarrow \boxed{\mu_s \ge \frac{m\sin\theta\cos\theta}{M + m\cos^2\theta}}$$