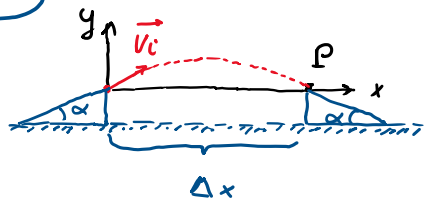
3.20

$\alpha = 18°$ $\quad v_i = 120\ km/h = 33,\bar{3}\ m/s$



(a). Détermination du temps de vol Δt

$$\Delta y = 0 = \frac{1}{2} a (\Delta t)^2 + v_{iy} (\Delta t) = -\frac{1}{2} 9,81 (\Delta t)^2 + 33,\bar{3} \sin 18 (\Delta t)$$

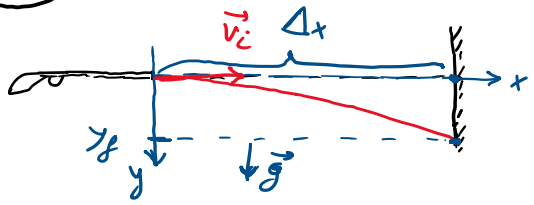
$$= \Delta t \left(-\frac{1}{2} \cdot 9,81 \cdot \Delta t + 33,\bar{3} \sin 18 \right) = 0$$

$$\Rightarrow -\frac{1}{2} 9,81 \Delta t + 33,\bar{3} \sin 18° = 0 \quad \Rightarrow \quad \Delta t = \frac{33,\bar{3} \cdot \sin 18}{0,5 \cdot 9,81} \simeq 2,1\ s$$

(b). Calcul de Δx : $\quad \Delta x = v_i \cos\alpha \, \Delta t = 33,\bar{3} \cdot \cos 18 \cdot 2,1 \simeq 66,57\ m$

$\rightarrow$ 33 voitures

3.21



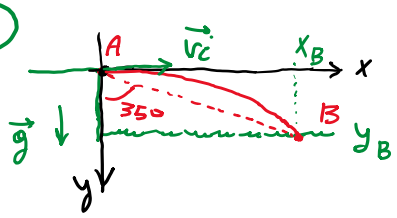
(a). temps de vol Δt :

$$\Delta y = y_f = \frac{1}{2} a (\Delta t)^2$$

$$0,025 = \frac{1}{2} 9,81 (\Delta t)^2 \quad \Rightarrow \quad \Delta t = \sqrt{\frac{2 \cdot 0,025}{9,81}} \simeq 7,14 \cdot 10^{-2}\ s$$

(b). $\Delta x = v_i \cdot \Delta t = 670 \cdot 7,14 \cdot 10^{-2} \simeq 48\ m$

3.22



(a). Calcul de y_B :

$$\Delta y = y_B = \frac{1}{2} a (\Delta t)^2 = \frac{1}{2} 9,81 \cdot 2,6^2 = 33,1578...\ m$$

(b). Calcul de v_i

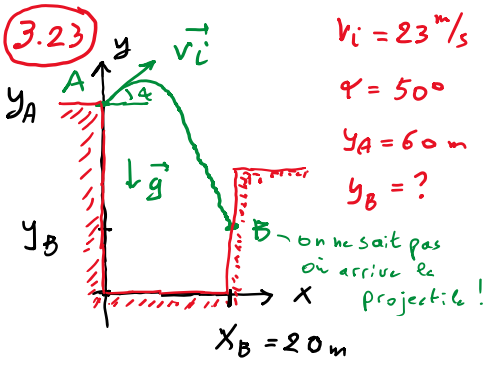
On sait que $x_B = v_i \cdot \Delta t$ (2 inconnues)

Mais ... on sait aussi que $\tan 35° = \frac{x_B}{y_B}$

$$\Rightarrow x_B = y_B \cdot \tan 35°$$

$$\Rightarrow v_i = \frac{x_B}{\Delta t} = \frac{y_B \tan 35°}{\Delta t} \simeq 8,9\ m/s$$

3.23



$v_i = 23\ m/s$

$\varphi = 50°$

$y_A = 60\ m$

$y_B = ?$

(a) Calcul du temps de vol Δt : $\Delta x = v_i \cos\alpha \, \Delta t$

$$\Rightarrow \Delta t = \frac{\Delta x}{v_i \cos\alpha} = \frac{20}{23 \cos 50} \simeq 1,35\ s$$

(b). Calcul de Δy : $\Delta y = y_B - y_A = \frac{1}{2} a (\Delta t)^2 + v_{iy} (\Delta t)$

$$\Rightarrow y_B = y_A - \frac{1}{2} 9,81 \cdot (\Delta t)^2 + 23 \sin\alpha (\Delta t)$$

$$y_B = 60 - \frac{1}{2} 9,81 (1,35)^2 + 23 \sin 50 (1,35) \simeq 75\ m$$

au-dessus du départ !