Problemas

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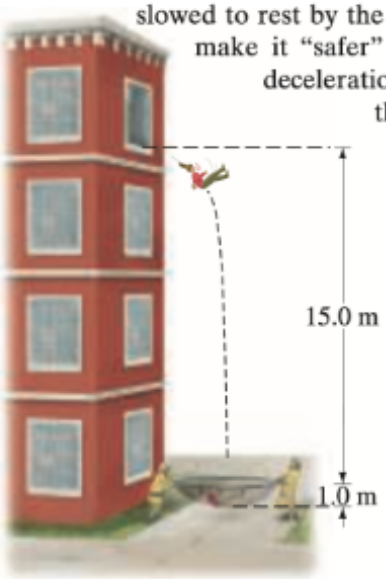
June 6, 2020

Problema 1:

A person jumps from a fourth-story window 15.0 m above a firefighter's safety net. The survivor stretches the net 1.0 m before coming to rest, Fig. 46. (*a*) What was the average deceleration experienced by the survivor when she was slowed to rest by the net? (*b*) What would you do to make it "safer" (that is, to generate a smaller deceleration): would you stiffen or loosen the net? Explain.



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solución:

Vo = 0

Y = 0

Yo = 15 m

Ecuacion: V2 = V2 o - 2g (y -yo)

Se sustituye en la formula

$$V^2 = 0 - 2 \left(9.8 \frac{m}{s^2}\right)(0 - 15m)$$

$$V = \sqrt{2\ \ (9.8\frac{m}{s^2})(15m)} = 17.5\frac{m}{s}$$

con esta velocidad llega a tocar la red

Para calcular la aceleracion promedio se despeja la aceleración de la ecuacion

V2 = V2 o - 2g (y -yo)

$$a = \frac{v^2\ -\ V^2}{2\,(y\ -Yo)}$$

variables

$$Vo = 17.15\ \frac{m}{s}$$

$$V = 0$$

$$Yo = 0$$

$$y = 0$$

Se sustituye

$$a = \frac{(0)^2(17.15\frac{m}{s})^2}{2(1-1m)} = \frac{(-17.15\frac{m}{s})^2}{-2m} = 147.06\frac{m}{s^2}$$

se desacelera

B) Como le harían para que la desaceleracion fuera menor?

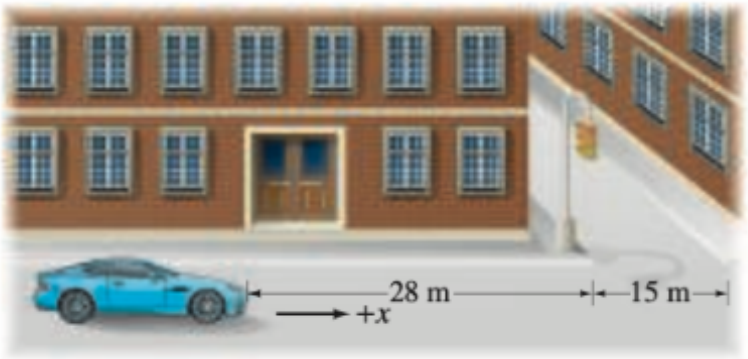
$$A = \frac{v^2\ -\ Vo}{2\ (y-\ Yo)}$$

$$Y - Yo$$

Esto para permitir que la red se eleve mas

Problema 2:

A person driving her car at 45 km/h approaches an intersection just as the traffic light turns yellow. She knows that the yellow light lasts only 2.0 s before turning to red, and she is 28 m away from the near side of the intersection (Fig. 51). Should she try to stop, or should she speed up to cross the intersection before the light turns red? The intersection is 15 m wide. Her car's maximum deceleration is $-5.8\,\text{m/s}^2$, whereas it can accelerate from 45 km/h to 65 km/h in 6.0 s. Ignore the length of her car and her reaction time.



Solucion

$Vo = 12.5\ \frac{m}{s}$

Caso 1

$a = -5.8\ \frac{m}{s^2}$

$V^2 = Vo^2\ +\ 2a\ (X - Xo)$ $\qquad$ *Horizontal*

$2a\,(X - Xo) =\ V942 -\ Vo^2$

$X\ -\ Xo = \frac{V^2 - Vo^2}{2a}$

$V^2 = 0$ *se descarta*

$\frac{(-12.5\frac{m}{s})}{-2(5.8\frac{m}{s^2})} = 13.46S$

Si alcanza a frenar a tiempo

Caso 2

Necesitamos calcular la aceleración del auto para ver si alcanza a pasar la interceccion

$a = \frac{V - Vo}{t}$ $\quad o \quad$ $V = Vo + at$

$a = \frac{18.5\frac{m}{s} - 12.5\frac{m}{s}}{6\ s} = 0.925\frac{m}{s}$

Se sabe de cuanto tiempo dispone

$t = 2$ *segundos*

$X = \ Xo + Vo + \frac{1}{2} a \ t^2$

Movimiento acelerado horizontal

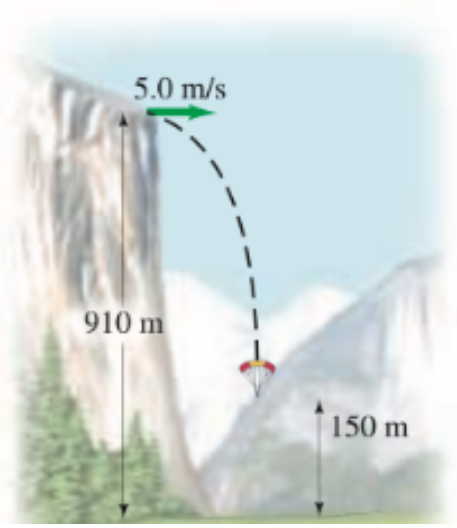
$= \left(12.5 \frac{m}{s}\right) \ (2 \ seg) \ + \frac{1}{2} \ \left(0.925 \frac{m}{s^2}\right) \left(2 \ seg^2\right)$

$X = 26.85 \ m$

Le conviene frenar, dado que solo podria avanzar 26.85 m y el trayecto es de 45

Problema 3:

(II) Extreme-sports enthusiasts have been known to jump off the top of El Capitan, a sheer granite cliff of height 910 m in Yosemite National Park. Assume a jumper runs horizontally off the top of El Capitan with speed 5.0 m/s and enjoys a freefall until she is 150 m above the valley floor, at which time she opens her parachute (Fig. 41). (*a*) How long is the jumper in freefall? Ignore air resistance. (*b*) It is important to be as far away from the cliff as possible before opening the parachute. How far from the cliff is this jumper when she opens her chute?



Solución

A) direccion X

$V_{xo} = \frac{X}{s}$

$X = \ V_{xo} \ t$

Direccion Y

$Y = yo \ + \ V_o t - \frac{1}{2} g \ \ t^2$

Para poder despejar el tiempo

$150m \ = 910m - 12gt^2$

$12gt^2 = 910m - 150m = 720m$

$t^2 = \frac{2\ (760m)}{9.81\ \frac{m}{s^2}}$

$t^2 = \frac{2\ (760m)}{9.81\ \frac{m}{s^2}} =\ 12.44\ s$

La persona en caida libre dura 12.44 s

B) Ahora en X

$X = Vo \cdot t$

$X =\ \left(5\ \frac{m}{s}\right)\ (12.44\ s)$

$X = 62.2\ m$

El saltador dura 12.44 s en caida libre y esta 62.2 m alejado del acantilado.