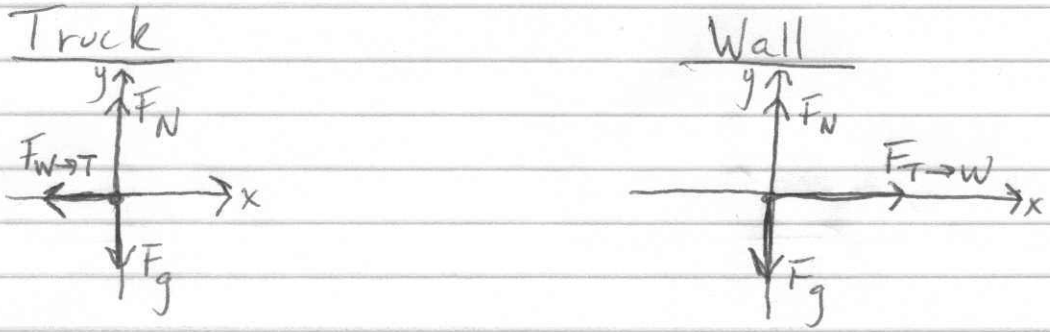
Solutions

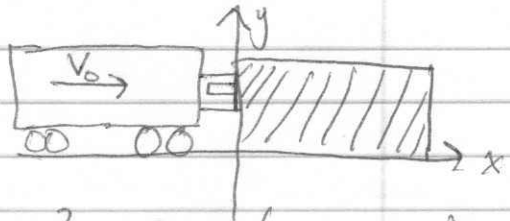
1) $95{,}000 \text{ lbs} \cdot \frac{\text{kg}}{2.2 \text{ lbs}} = 43{,}182 \text{ kg}$

$$\frac{80 \text{ miles}}{\text{hour}} \cdot \frac{5280 \text{ ft}}{\text{mile}} \cdot \frac{\text{meter}}{3.281 \text{ ft}} \cdot \frac{\text{hour}}{3600 \text{ seconds}}$$
$$= 35.8 \text{ m/s}$$

a)



b) The truck comes to a halt over a .1m distance



Truck
$x_o = 0m$
$x_f = .1 m$
$V_{ox} = 35.8 \text{ m/s}$
$V_{fx} = 0 \text{ m/s}$
$a_x = ?$
$t = ?$

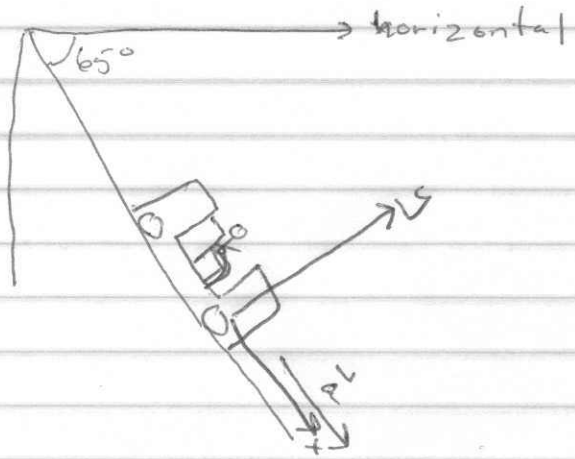
$$V_{fx}^2 = V_{ox}^2 + 2a_x(x_f - x_i)$$
$$\frac{V_{fx}^2 - V_{ox}^2}{2(x_f - x_i)} = a_x$$
$$a_x = -6408 \text{ m/s}^2$$

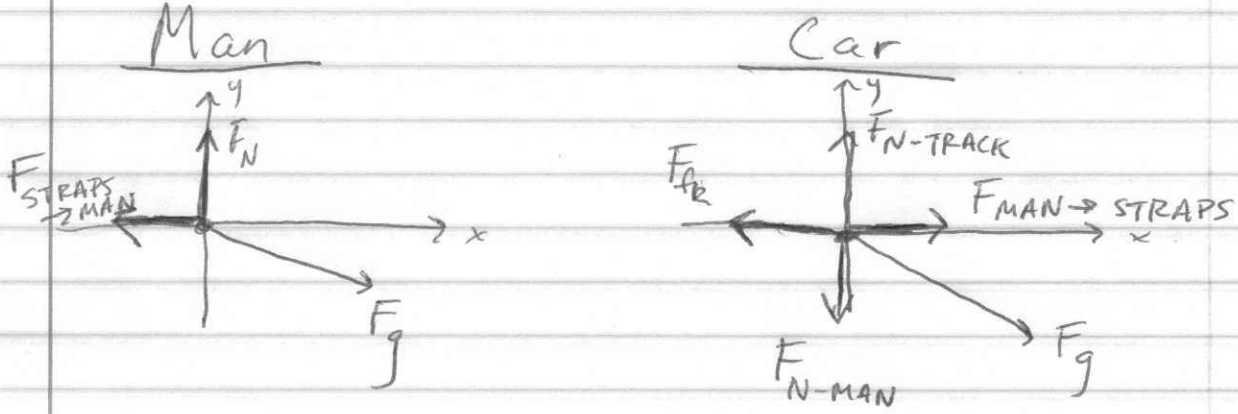
c) $\sum F_x = ma_x = 43{,}182 \text{ kg} \cdot -6408 \text{ m/s}^2$

$= 276{,}710{,}256 \text{ N}$ in the $-x$ direction

Solutions

2)





Since the man is sitting in the cart, the normal force of the track on the cart increases, increasing friction, therefore the man must push forward against the straps to counteract the increased friction.

Force Pairs

F_N on the man - A normal force pushing down on the cart

$F_{STRAPS \rightarrow MAN}$ and $F_{MAN \rightarrow STRAPS}$ - A pair of normal forces

F_N on the car - A normal force on the track

F_{fr} on the car - A frictional force on the track

F_g on both man and cart - A gravitational force on the earth.

A force pair must be from forces that are the same type