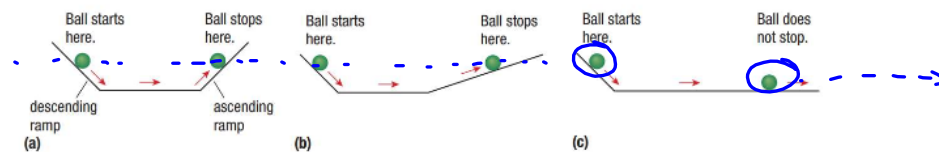


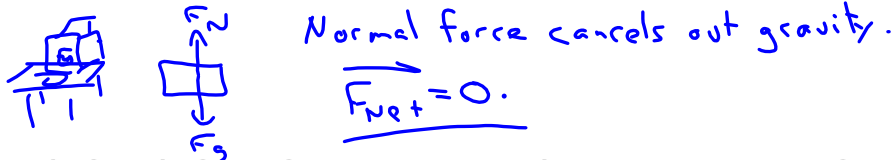
SPH3U: 3.2 Newton's First Law of Motion**1. Inertia**

Inertia:	the property of matter that resists changes in motion. More mass = more inertia.
Newton's first law of motion	If the net force on an object is zero, the object will remain at rest or keep moving at a constant speed. $\vec{F}_{\text{net}} = 0 \rightarrow \vec{a} = 0$ An object can't change velocity without a force.
Isaac Newton	Born in 1642 (year that Galileo died). Published Principia Mathematica (3 Laws)
Galileo Galilei's thought experiment	(Below) Ball rolls back up to the same height that it started at, always.

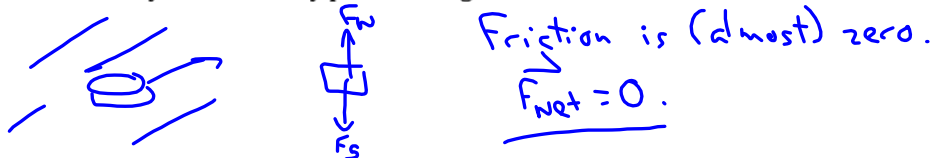


Use Newton's first law to explain each situation below:

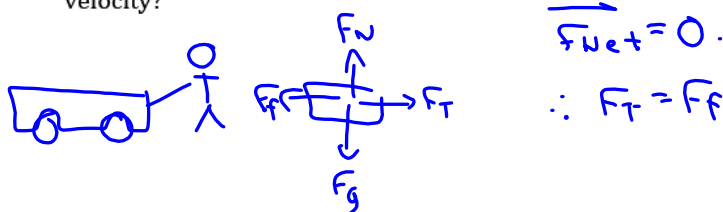
- a. Why does a computer sitting on a desk remain at rest?



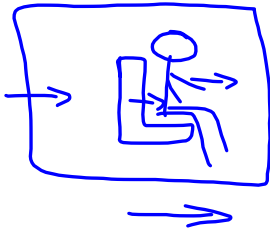
- b. Why does a hockey puck moving across smooth ice move at a constant velocity?



- c. Why does a wagon pulled across a rough surface by a child move at a constant velocity?



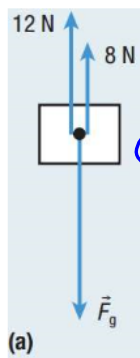
Older cars did not have headrests, but all new cars do. How do headrests help prevent injuries during a rear-end collision? Use Newton's first law to explain your answer.



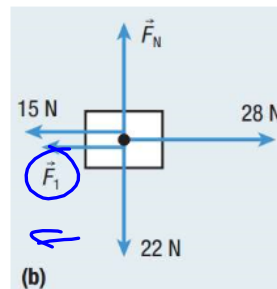
Car moves forward, head does not.

Headrest helps move your head forward with the rest of your body.

What is the missing force on each FBD shown below? Figure a) is an object at rest and Figure b) is an object moving left at a constant velocity.



$$\begin{aligned} \vec{F}_{\text{net}} &= 0 \\ \vec{F}_{\text{net}} &= 12 + 8 - F_g \\ 0 &= 12 + 8 - F_g \\ F_g &= 12 + 8 \\ &= \underline{\underline{20 \text{ N [d]}}} \end{aligned}$$

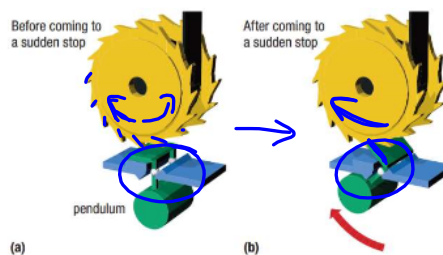


$$\begin{aligned} \vec{F}_{\text{net}} &= 0 \\ \vec{F}_{\text{net}x} &= 0 \\ 0 &= 28 - 15 - F_1 \\ F_1 &= 28 - 15 \\ &= \underline{\underline{13 \text{ N [w]}}} \\ \vec{F}_{\text{net}y} &= 0 \\ 0 &= F_N - 22 \\ F_N &= \underline{\underline{22 \text{ N [u]}}} \end{aligned}$$

2. Applications of Newton's first law

Seat belt:

In a collision, the pendulum keeps moving forward, causing a metal piece to lock the gear in place.



Homework: page 129: #2-4, 7, 10, 13