# CHAPTER 2: FORCES, NEWTON'S LAWS, AND STATICS

## Now we're doing *physics!!*

# Announcements

- Help room starts tomorrow!
  - Ch 1 &2 homework due on Friday
- Last chance to register clickers!
  - I'm downloading participation this Friday!

# Reading Questions

I would like to go over the free body diagrams a little more, mostly in respect to the forces working against one another.

The practice of drawing and labeling free body diagrams correctly.

I would like to talk more about Newton's second law and the equation that describes it.

I'd like a little more clarification on Newton's second law. Isn't it easier to use mass times acceleration?

I understand the laws in word but when it comes to the equations they become more difficult for me to comprehend.

Is there a point where free body diagrams are impractical?

What happens when I throw a ball across the room? What is pushing on it to keep it moving while it flies through the air?


A. Me (the quarterback)
B. The air
C. The ball
D. Nothing
E. Something else

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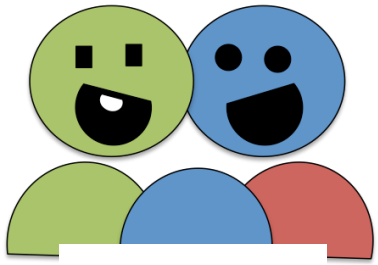


So then why do moving things tend to stop? Why are most things standing still?

# Friction!

You are driving at a speed of 30 miles/hour when your car hits a long patch of black ice. Fortunately, the road is straight and there is nothing in front of you. You take your foot off the gas and jam on the brakes, keeping the steering wheel turned so the wheels point straight ahead. Your wheels stop spinning. What happens to your car?


A. It will quickly slow down and stop.
B. It will keep going at about the same speed.
C. It will skid sideways.
D. There is not enough information to tell.

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# Conceptual ideas underlying Newton's Laws: 1

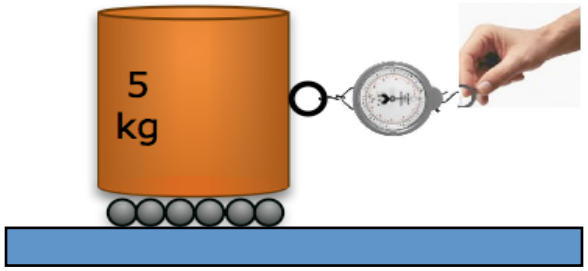
- Objects respond only to influences acting upon them at the instant that those influences act. (**Inertia**)
  - All outside effects on an object being equal, the object maintains its velocity (including direction).
  - The velocity could be zero, which would mean the object is at rest.
- Every change in velocity an object experiences is caused by the object interacting with some other object – forces. (**Interactions**)

# Conceptual ideas underlying Newton's Laws: 2

- If there are a lot of different objects that are interacting with the object we are considering, the overall result is the same as if we add up all the forces as vectors and produce a single effective force -- the *net (or total) force*. (**Superposition**)
- When one object exerts a force on another, that force is shared over all parts of the structure of the object. (**Mass**)
- Whenever two objects interact, they exert forces on each other. (**Reciprocity**)

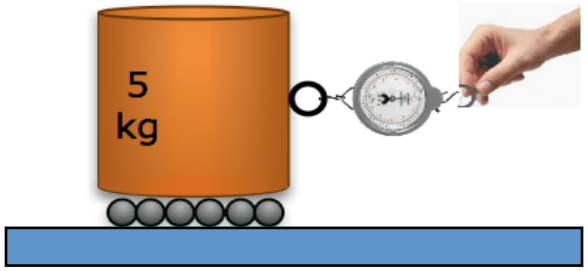

You are pulling the block along a table
To ensure that the block speeds up at a constant rate you need to

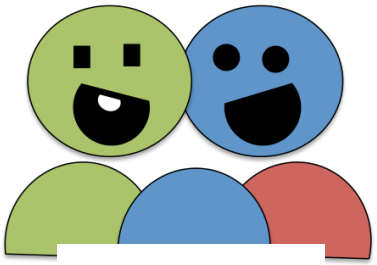
A. Pull with a decreasing force.
B. Pull with a constant force.
C. Pull with an increasing force.
D. Not pull at all.




You are pulling the block along a table
To keep the block moving at constant speed you need to

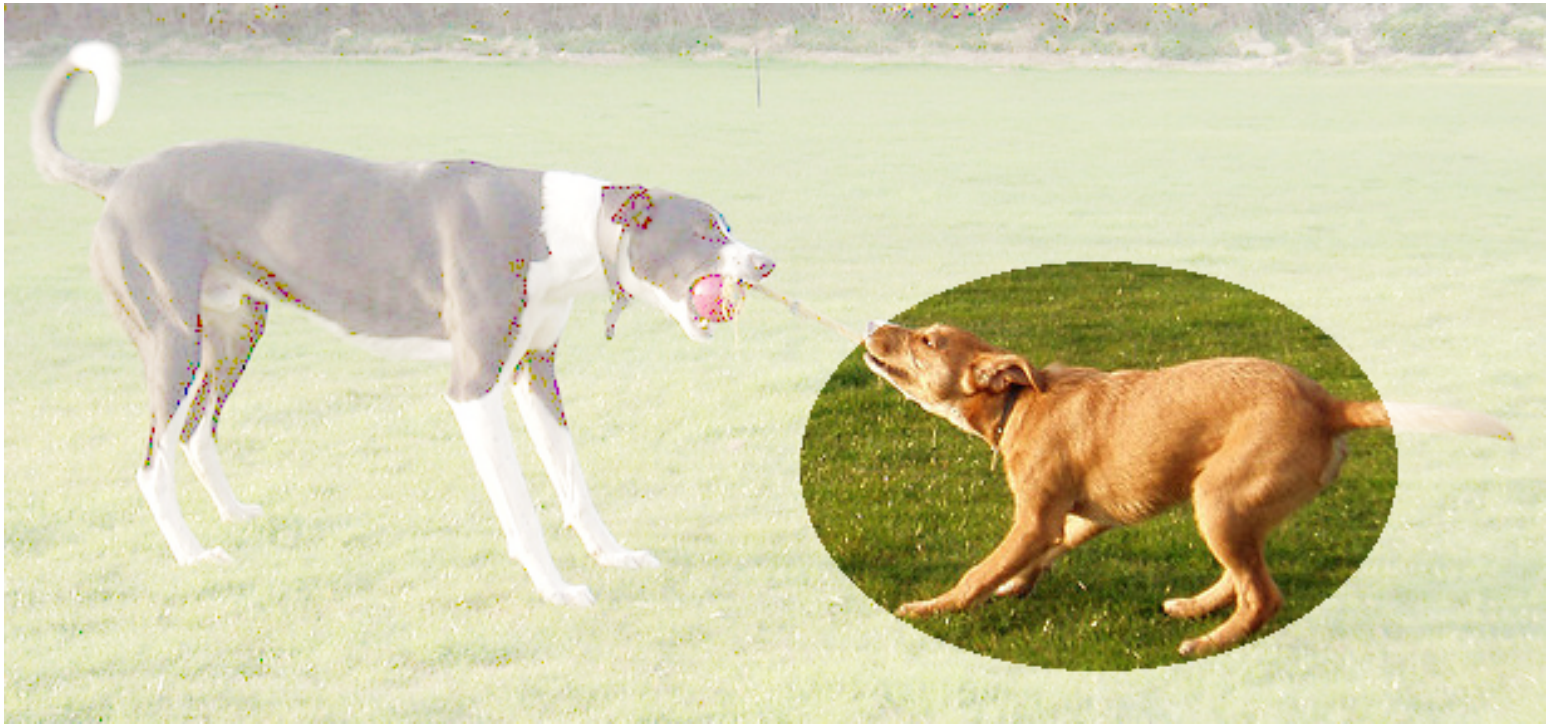
A. Pull with a decreasing force.
B. Pull with a constant force.
C. Pull with an increasing force.
D. Not pull at all.



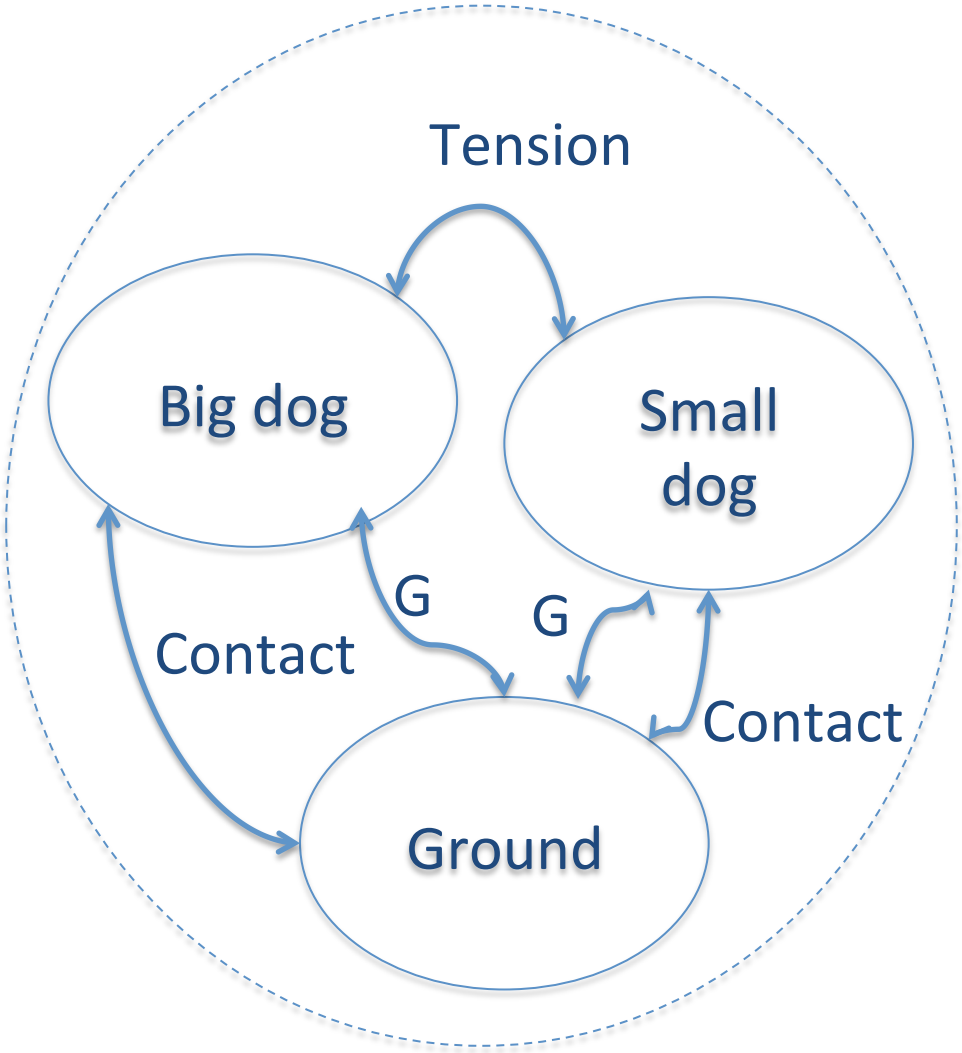



- Consider dog 2 in the two-dog tug-of-war. He isn't moving. Why not?
- Come up with a representation that shows why he isn't moving.

# Thinking about motion



# Analysis Tool: System Schema




1. Identify and all objects that influence the situation you are describing, represent each object with a circle and a label.
2. Identify all interactions between the objects. Represent each interaction with a two headed arrow, and label the interaction