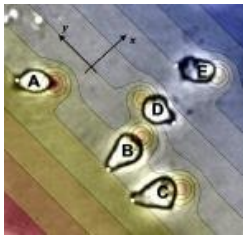
Physics 131- Fundamentals of Physics for Biologists I



Professor: Wolfgang Losert
wlosert@umd.edu

HW: Link under "HW" tab on webpage to a page that shows how to submit numerical answers in webassign. Note that roughly half the points are for correct reasoning.

Final exam Date now listed on our website

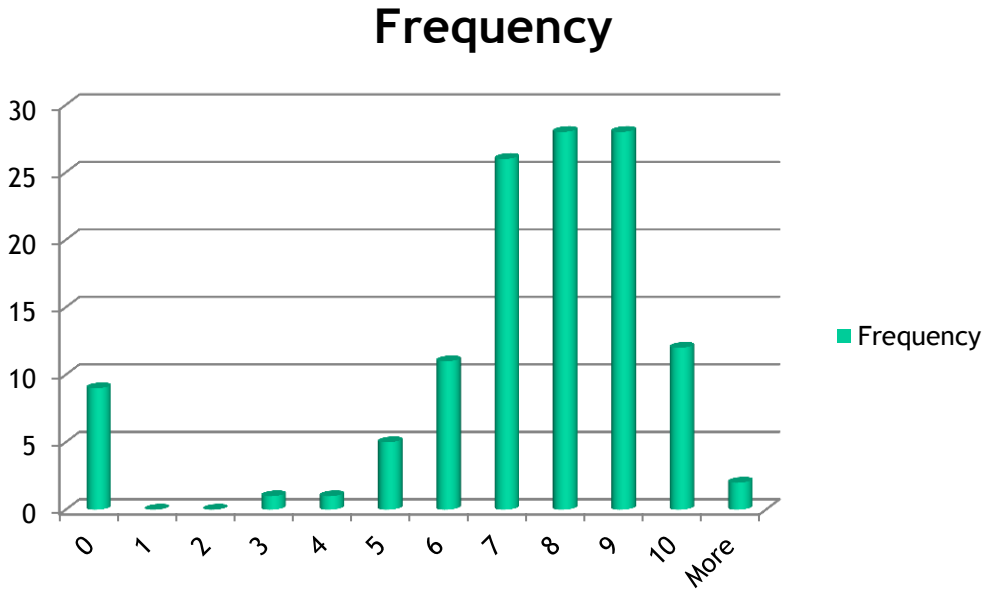
MIDTERM 1: October 4 (Sample exams available Fri afternoon)

Will be similar to HW and quizzes and in class activities.

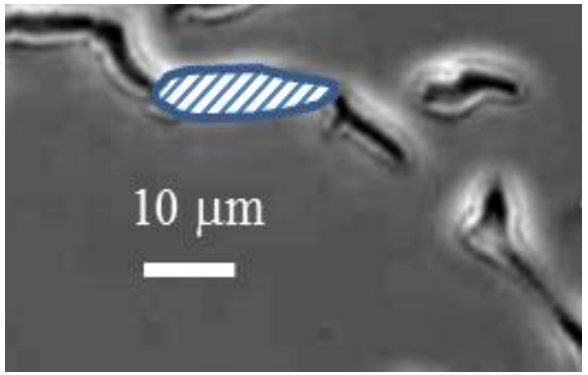
Could also draw from labs and recitations.

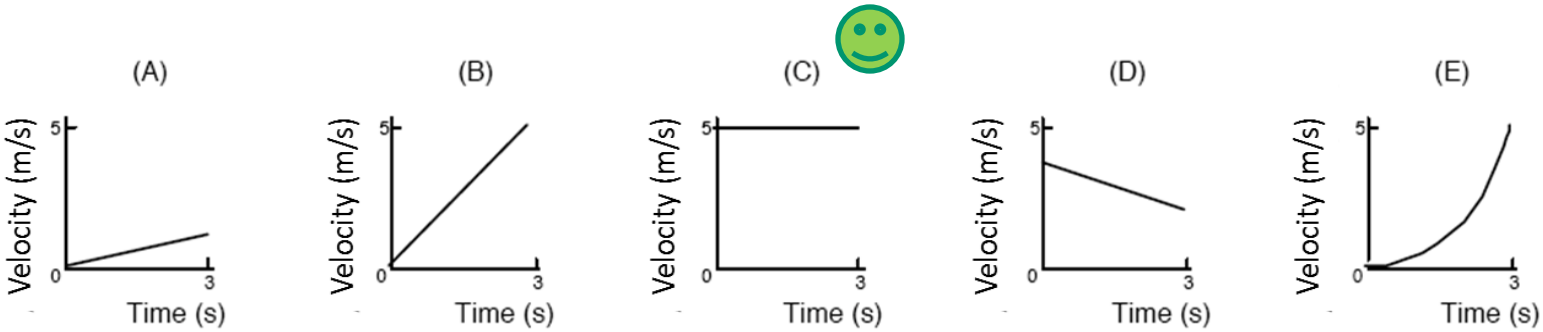
EXTRA office hours (in course center: **Monday 11am-noon**
Wednesday noon-1pm

Quiz 3
Ave: 7.3



System Schema and Forces



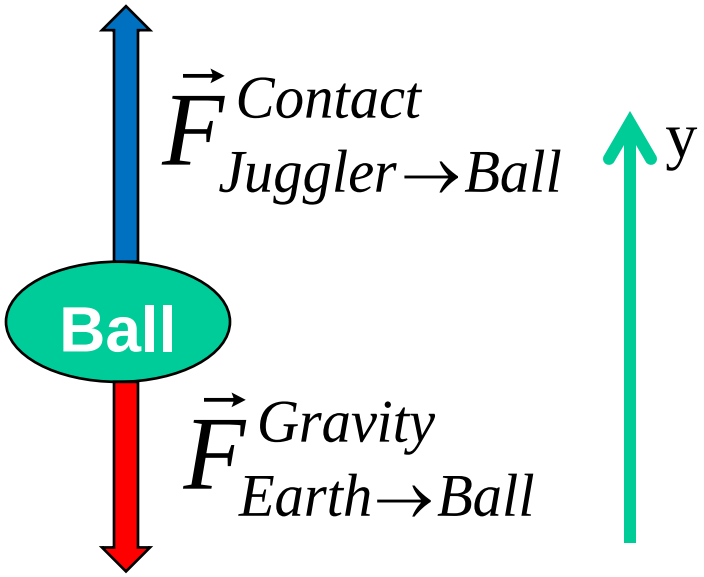


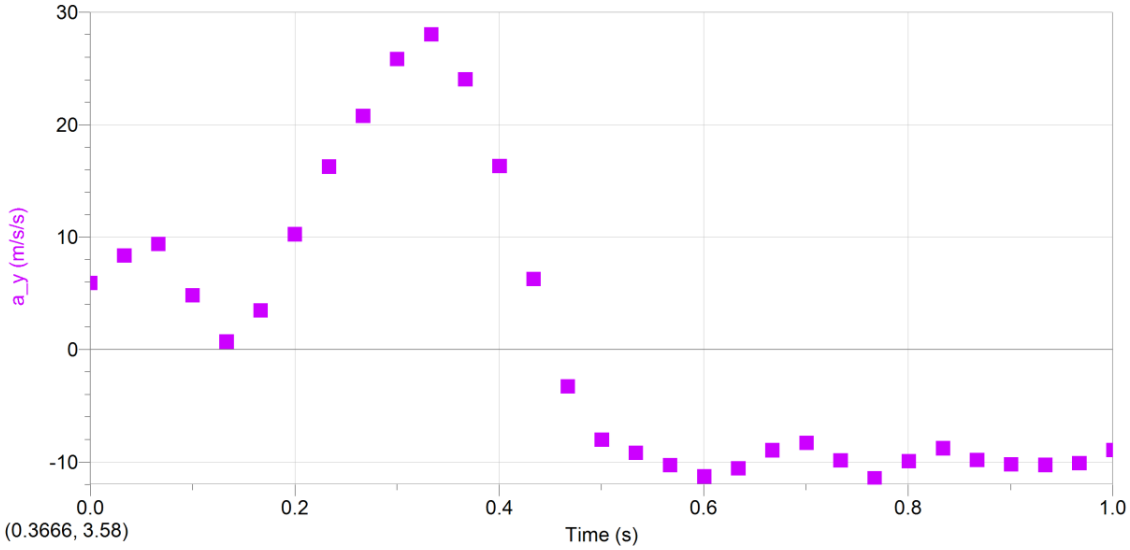
Which object has gotten the furthest from its starting position in three seconds?
Correct: C ***Why might one choose B?***

Comparing the objects moving according to graphs (B) and (E), which of the following is true

1. Both objects have the same velocity at t=3 seconds
2. **Both objects have the same average velocity**
3. Both objects have the same average acceleration
4. Both objects have the same acceleration at t=3 seconds

Dynamics (What Causes Motion (Chapter 4)

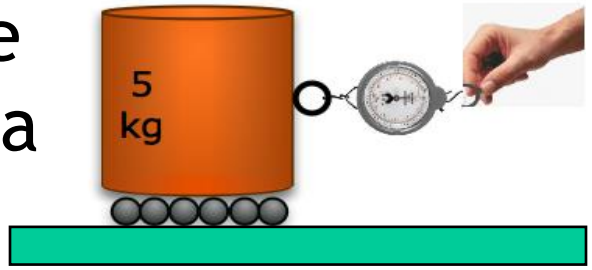




$$\vec{F}^{net} = \vec{F}_{Earth \to Ball}^{Gravity} + \vec{F}_{Juggler \to Ball}^{Contact}$$

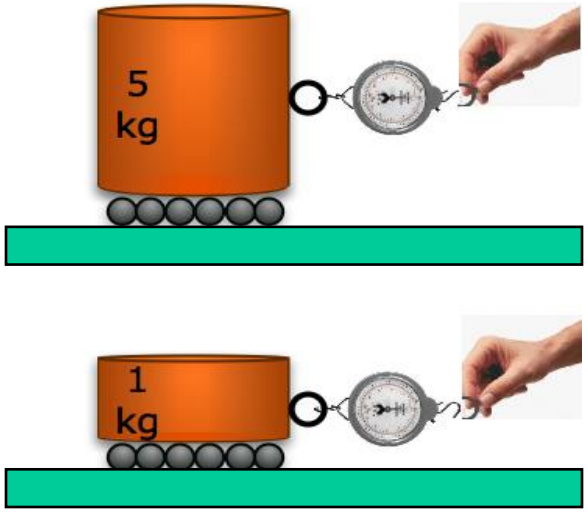
$$\vec{a} = \vec{F}^{net} / m$$

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



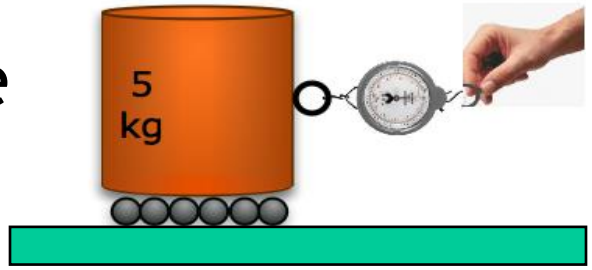
1. Pull with a decreasing force.
2. Pull with a constant force.
3. Pull with an increasing force.
4. Not pull at all.

You are pulling two blocks along a table with equal acceleration. Which one requires a larger force?



1. The 1 kg weight block
2. The 5 kg weight block
3. The require the same force.
4. There is not enough information to tell.

You are pulling the block along a table
To move the block at constant speed



1. Pull with a decreasing force.
2. Pull with a constant force.
3. Pull with an increasing force.
4. Not pull at all.

Newton's Laws

1. All outside effects on an object canceling out (net force of zero), the object maintains its velocity (including direction). The velocity could be zero, which would mean the object is at rest. (Inertia) [Newton 1]
2. The acceleration felt by an object (at a given instant) is the net force on the object at that instant divided by the object's mass. [Newton 2]
3. Whenever two objects interact, the forces they exert on each other are equal in magnitude and opposite in direction. (Reciprocity) [Newton 3]

$$\vec{a} = \vec{F}^{net} / m$$

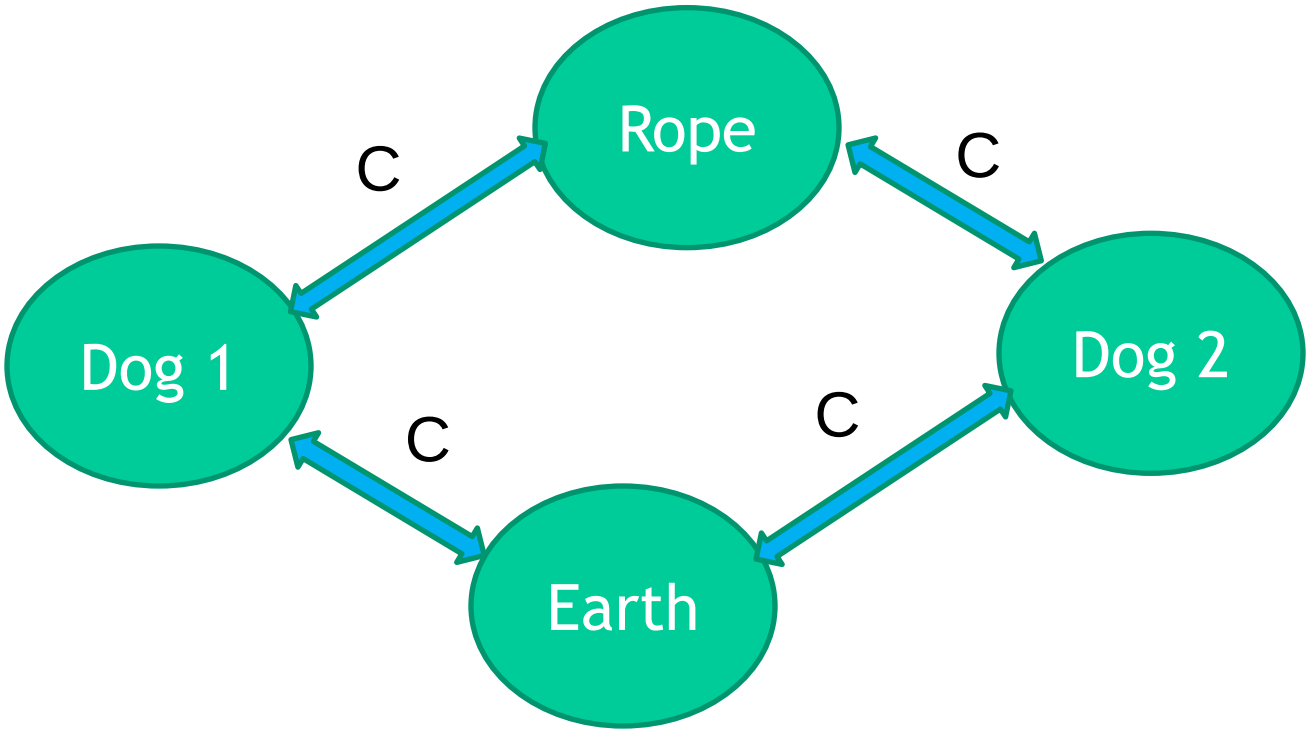
$$\vec{F}^{type}_{A \to B} = -\vec{F}^{type}_{B \to A}$$

Can any force ever act upon an object without changing or altering its velocity?

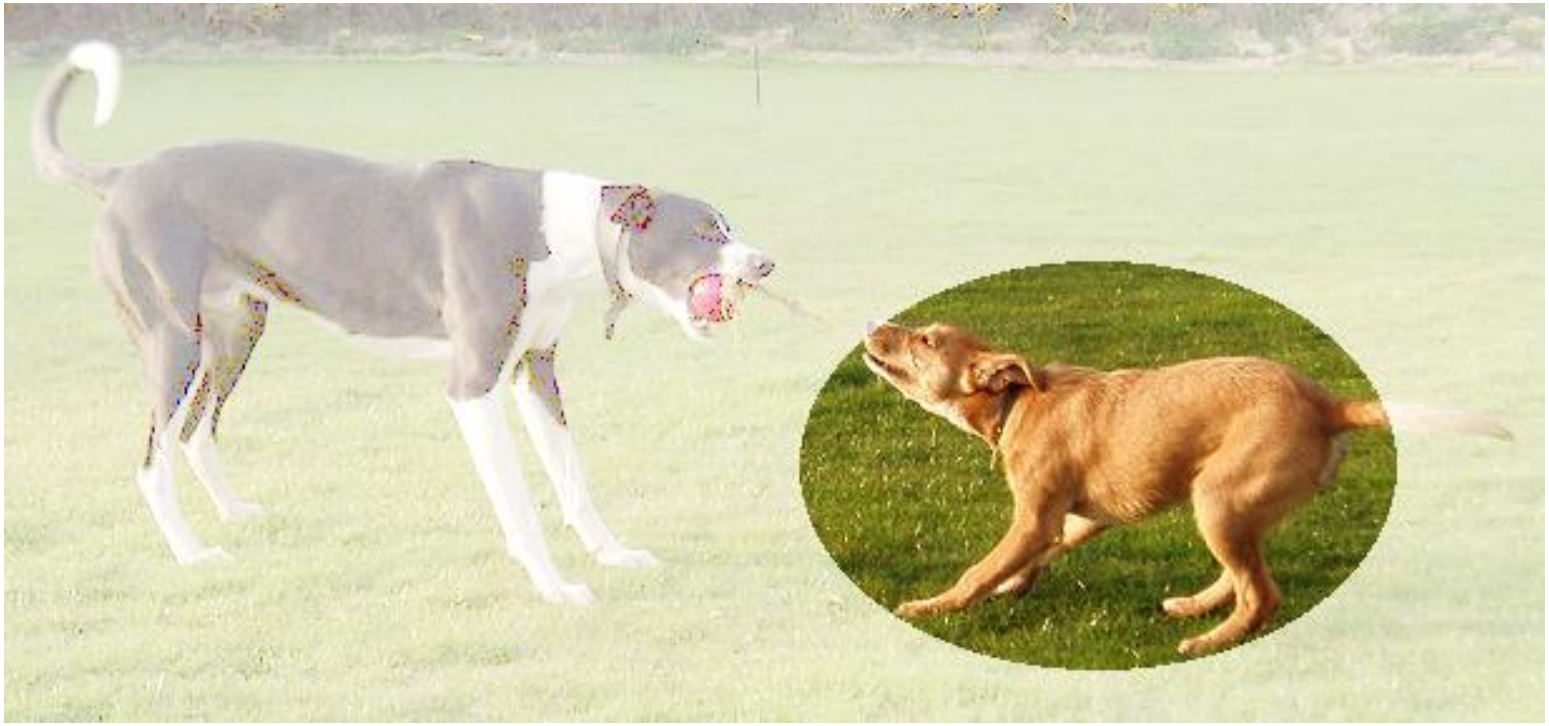
Are there forces without motion?

Draw a system schema and write down Newton's 3rd law force pairs **(Whiteboard, TA & LA)**

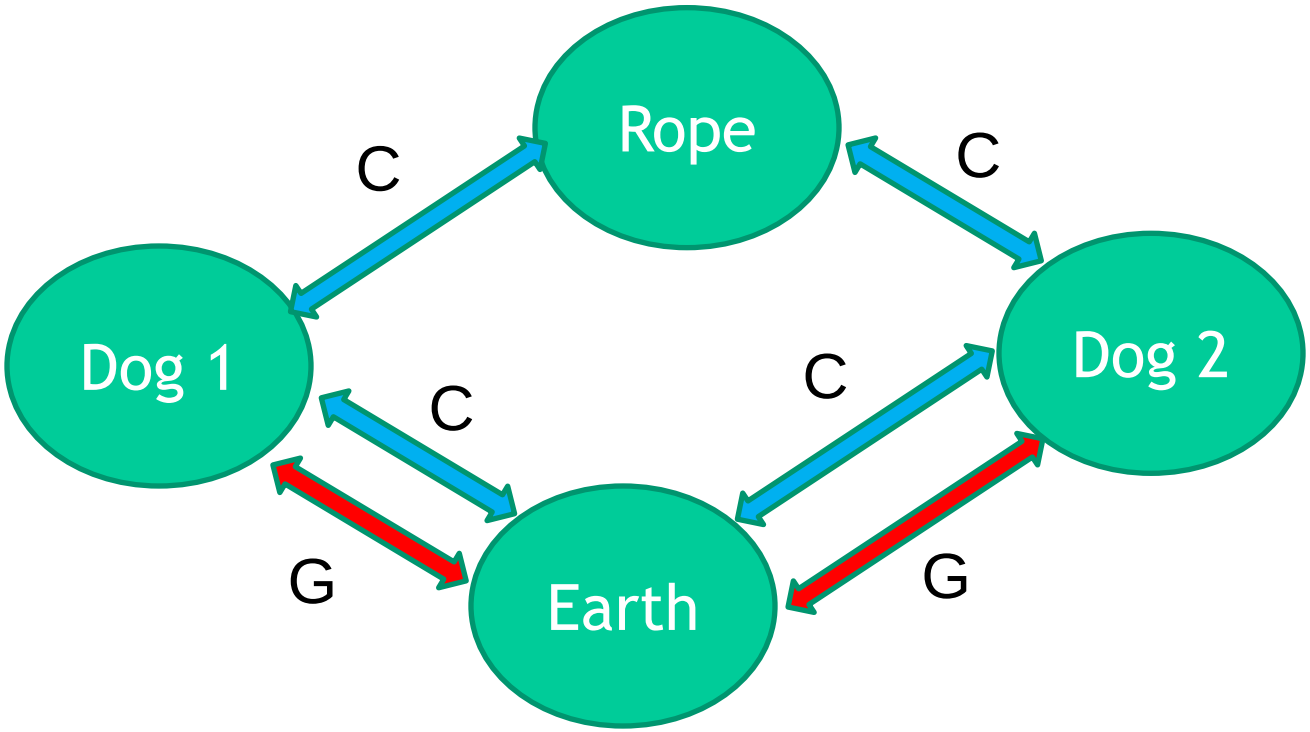
The System Schema for the two-dog tug-of-war



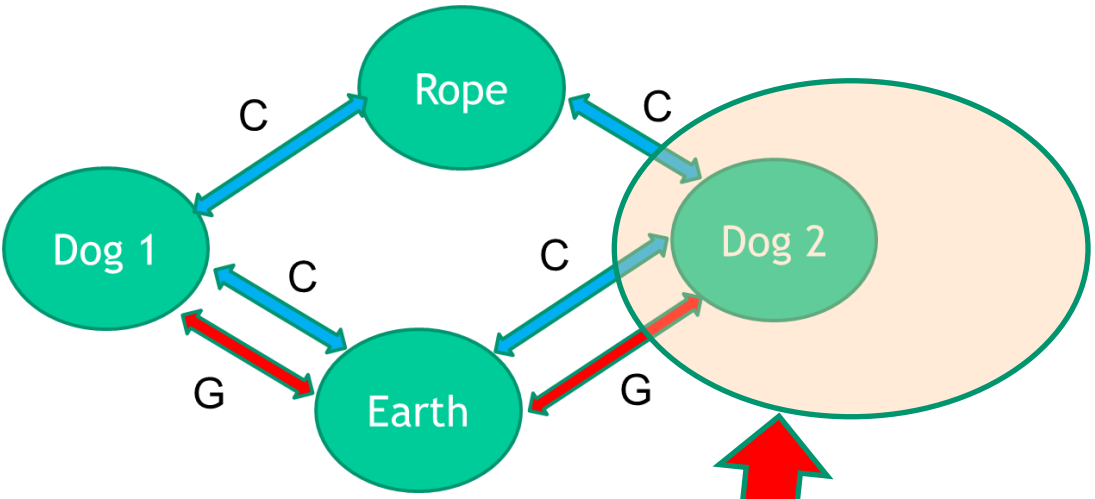
Focus on the motion of dog 2



The System Schema for the two-dog tug-of-war

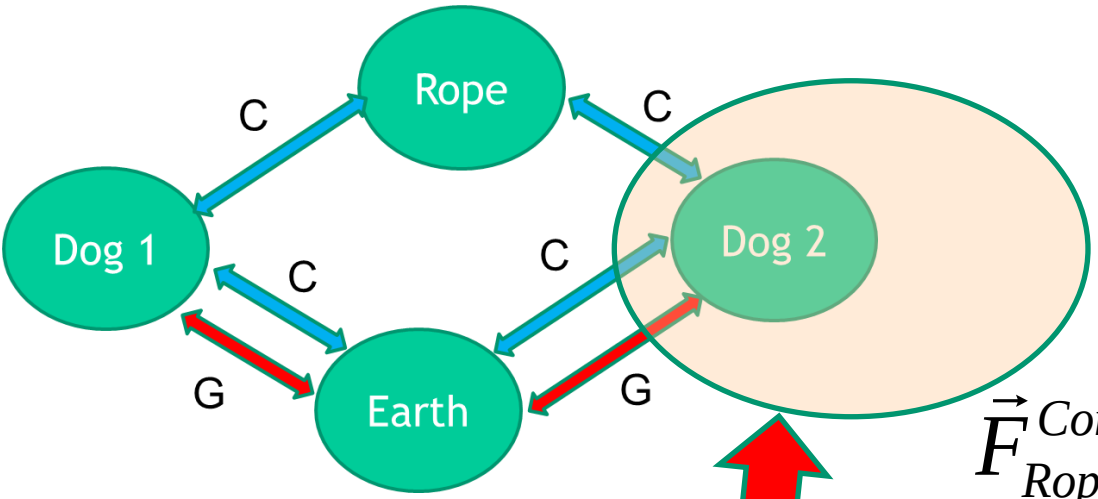


Draw free body diagram for dog 2 ***whiteboard (TA &LA)***



How many interactions with dog 2?

Free body diagram for dog 2



$\vec{F}_{Earth \rightarrow Dog\,2}^{Contact,Normal}$

$\vec{F}_{Rope \rightarrow Dog\,2}^{Contact}$

$\vec{F}_{Earth \rightarrow Dog\,2}^{Contact,Friction}$

Dog 2

$\vec{F}_{Earth \rightarrow Dog\,2}^{Gravity}$