

Physics 1100  
Lecture 2  
(Inertia)

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# Chapter 2 Topics

- What is **inertia**?
- Newton's **First Law** of Motion
- The concept of **force**
- Net force and **equilibrium**

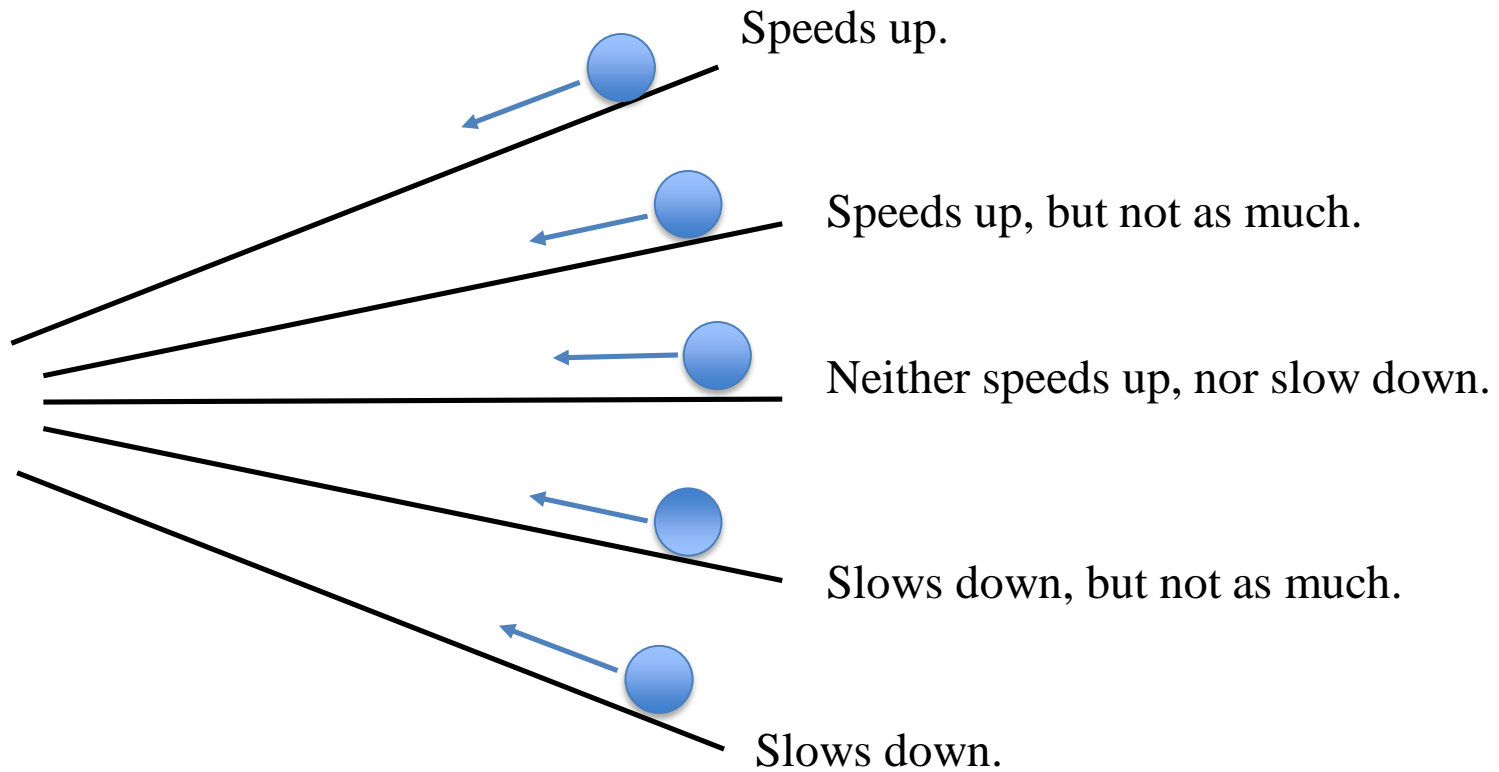
# What is INERTIA?

Inertia is...

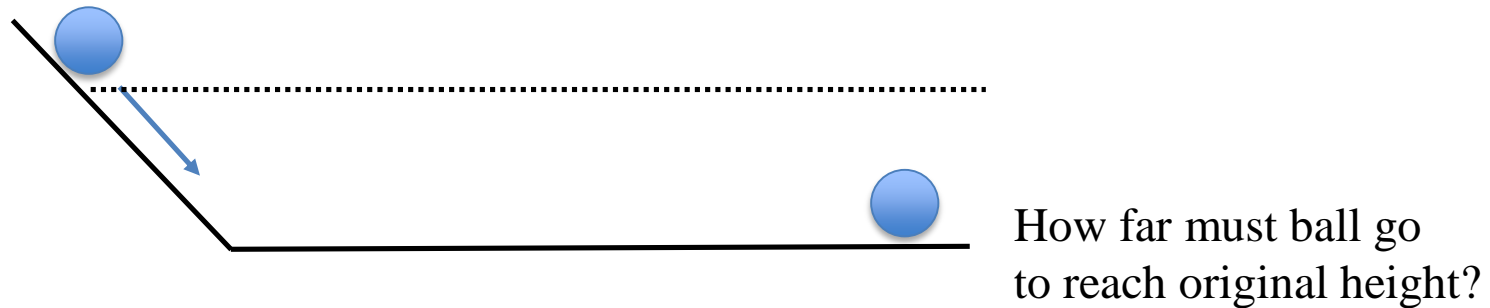
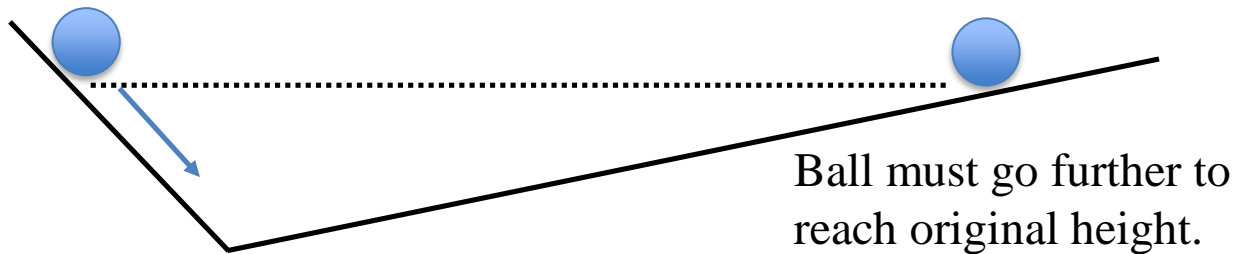
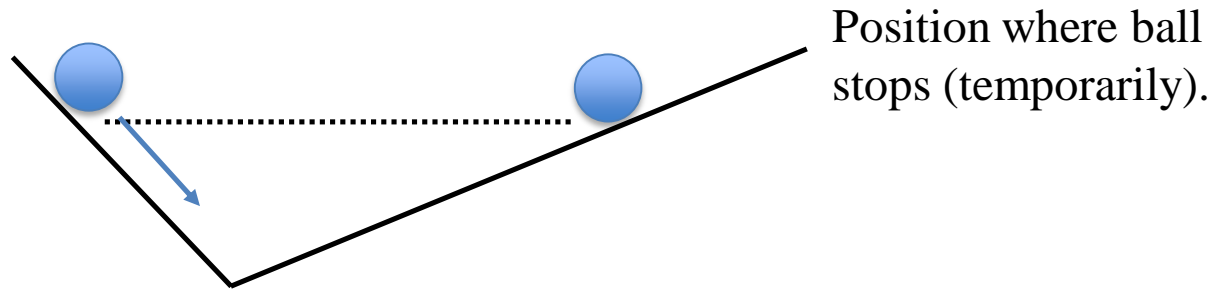
- ...“laziness.” (Translation from Latin.)
- ...resistance to change.
- ...the tendency for things to “keep on doing what they are already doing.”

In this context, inertia is an object’s resistance to change in its state of motion.

# Galileo's Experiments



# Galileo's Experiments (cont'd)



# Newton's First Law of Motion

Isaac Newton took Galileo's Principle of Inertia and incorporated it into his first law of motion:

An object at rest will remain at rest  
and an object in *uniform motion*\* will remain in motion  
unless acted upon by a (net) force.

\*Uniform motion: Constant speed in a straight line.

# The Concept of FORCE

What is a **force**?

For now, we will take a force simply as a “push” or a “pull.”

For example, a force can be exerted by...

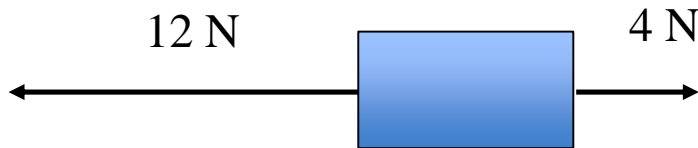
- a person pulling on a rope.
- the gravitational attraction between two objects.
- a tabletop that keeps a book from falling to the floor.
- the friction between surfaces in contact.

(...just to name a few.)

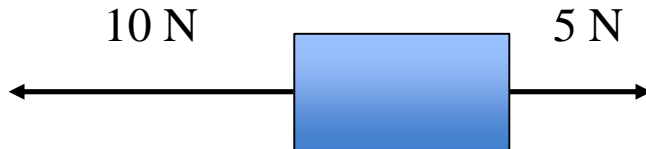
# Examples



$$F_{net} = 2 \text{ N}$$



$$F_{net} = 8 \text{ N}$$



$$F_{net} = 5 \text{ N}$$



$$F_{net} = 0 \text{ N}$$



# Mechanical Equilibrium

When  $\mathbf{F}_{\text{net}} (= \Sigma\mathbf{F}) = 0 \text{ N}$ ,

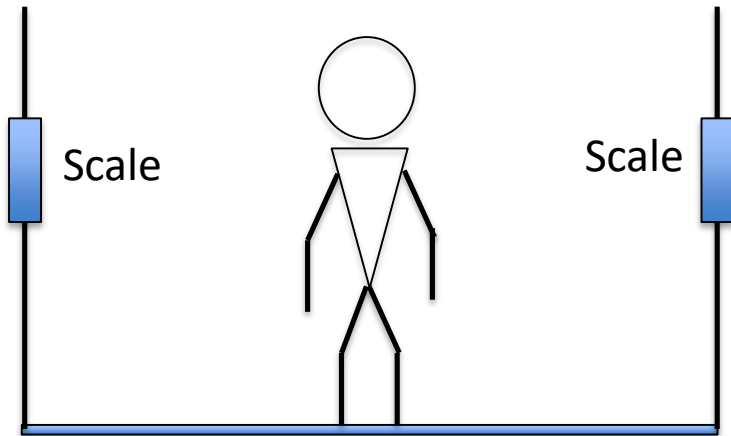
There is no change in the state of motion.

Static equilibrium:                      Velocity remains zero.

Dynamic Equilibrium:                      (Nonzero) velocity  
remains constant.

# Example

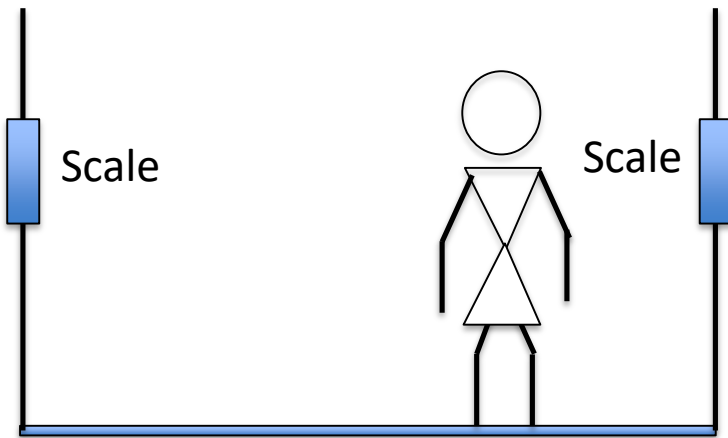
The scaffold weighs 100 N. A person weighing 700 N stands in the middle of the scaffold. What do the left and right scales read?



Each reads 400 N.

# Example

Now a 500 N person stand on the scaffold so that the right scale reads 400 N. What does the left scale read?



Left scale reads 200 N.