

**University of Virginia**

**Department of Physics**

Physics 606: How Things Work II

Lecture #4 Slides:

**Force and Work**

## Physics Concept

- Net Force
  - The sum of all forces on an object.
  - Determines object's acceleration.

## Newton's Third Law

For every force that one object exerts on a second object, there is an equal but oppositely directed force that the second object exerts on the first object.

## Experiment:

If you push on a friend who is moving away from you, how will the force you exert on your friend compare to the force your friend exerts on you?

1. You push harder
2. Your friend pushes harder
3. The forces are equal in magnitude

## Forces Present:

1. On ball due to gravity (its weight)
2. On ball due to support from table
3. On table due to support from ball

All three forces have the same magnitude for the stationary ball

## Forces Present:

1. On ball due to gravity (its weight)
  2. On ball due to support from table
  3. On table due to support from ball
- } Pair

## Forces Present:

1. On earth due to gravity from the ball
  2. On ball due to gravity from the earth
  3. On ball due to support from table
  4. On table due to support from ball
- } Pair

- Since the ball doesn't accelerate, 2 and 3 must cancel perfectly

### Question:

Can a ball ever push downward on a table with a force greater than the ball's weight?

### Two Crucial Notes:

- While the forces two objects exert on one another must be equal and opposite, the net force on each object can be anything.
- Each force within an equal-but-opposite pair is exerted on a different object, so they don't cancel directly.

### Physical Quantities

- Energy
  - A conserved quantity
  - The capacity to do work
- Work
  - The mechanical means of transferring energy.
  - $\text{work} = \text{force} \cdot \text{distance}$   
(where force and distance are in the same direction)