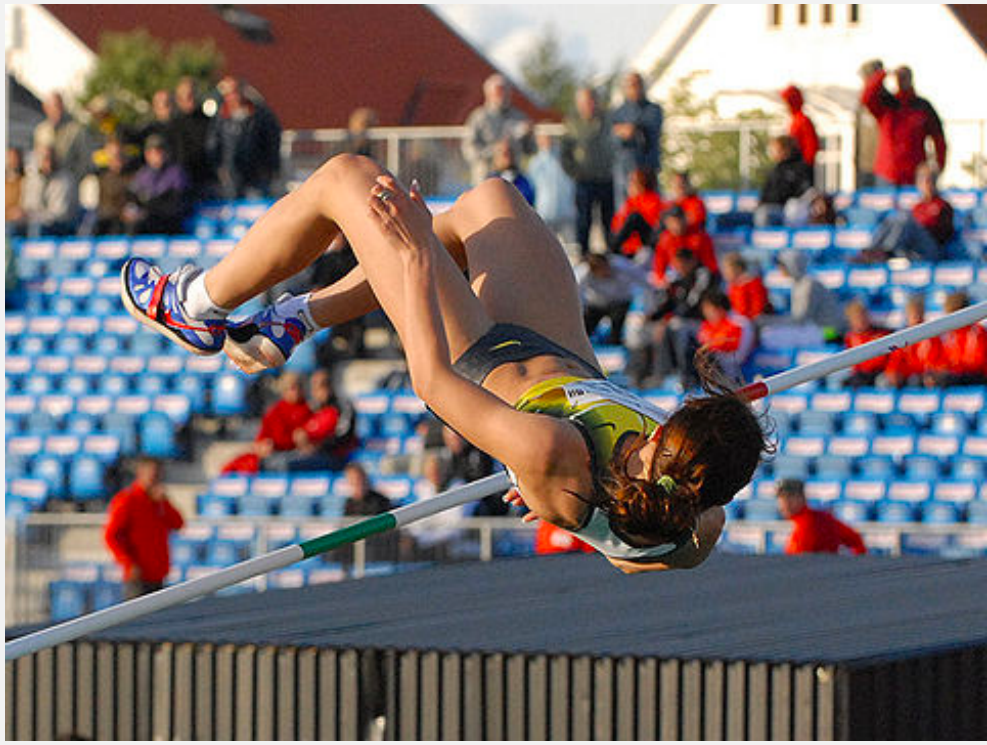
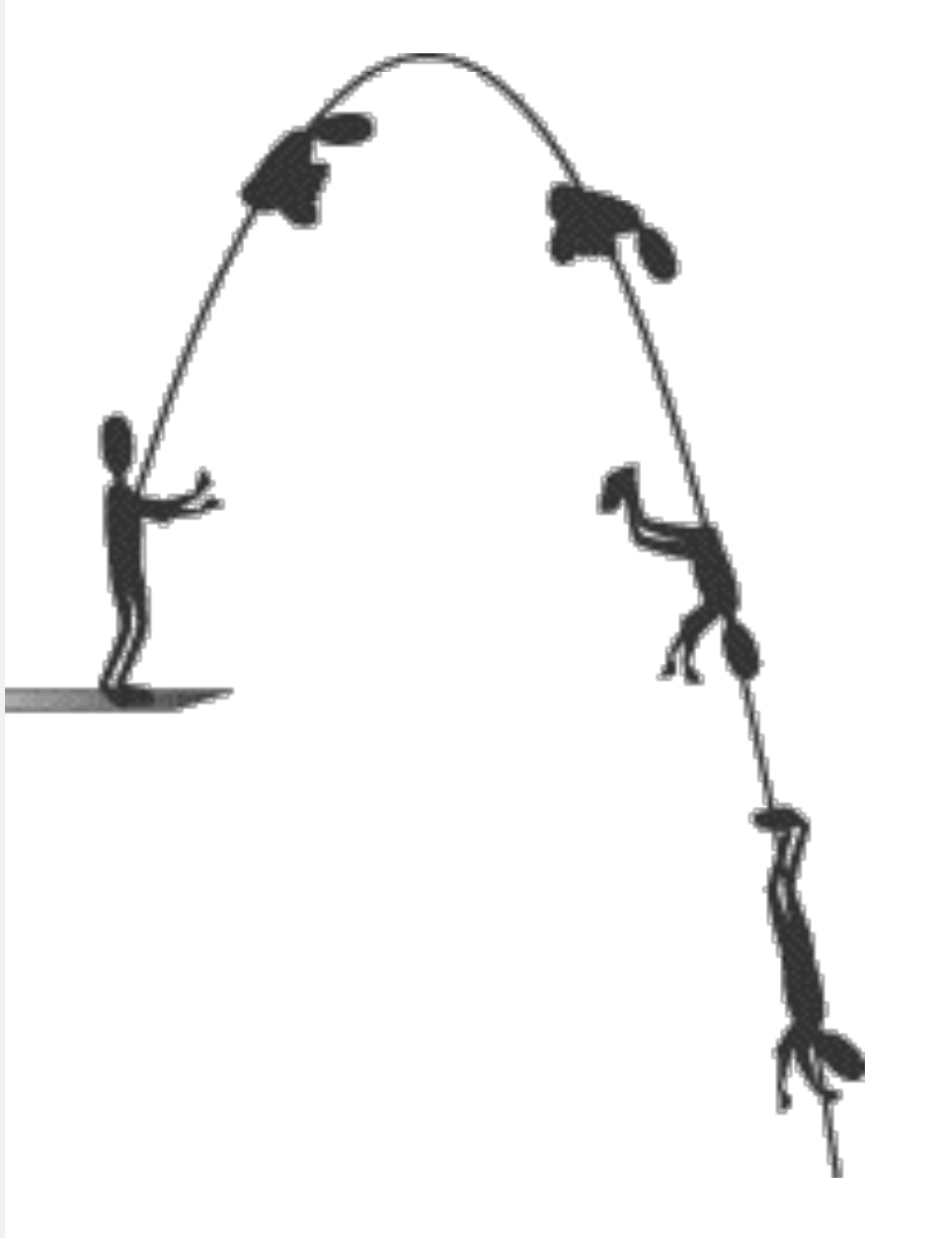
- Why do high jumpers jump backwards and arch their backs to get over the bar?
- How do high jumpers use the concept of the center of mass to jump higher with the same amount of force?



https://www.youtube.com/watch?v=RaGUW1d0w8g

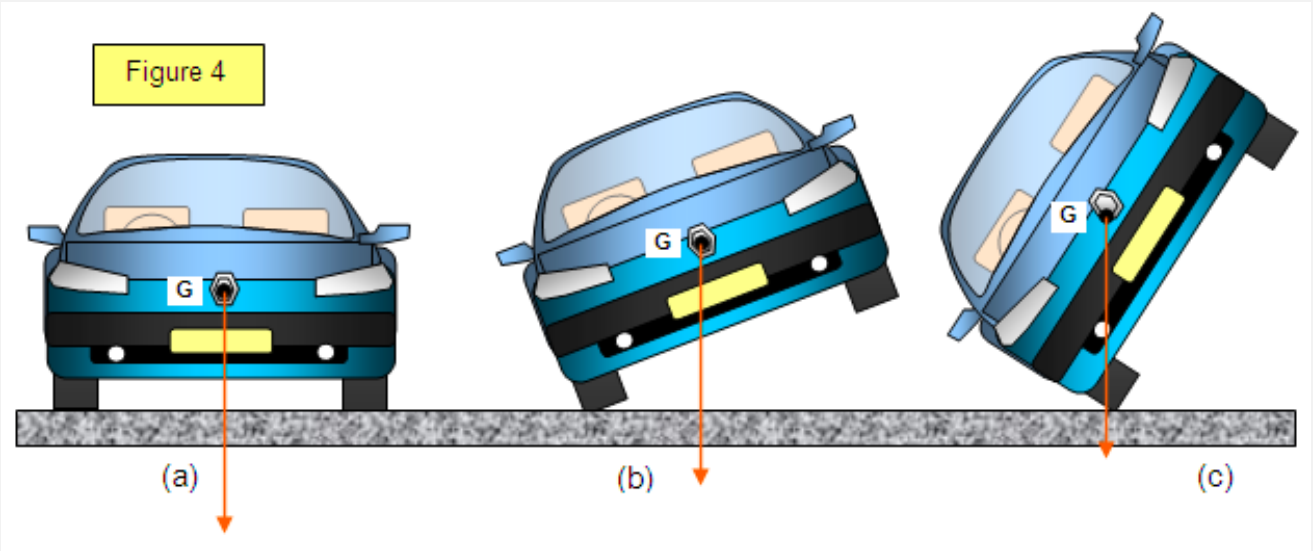
CENTER OF MASS

- In real life, objects aren't just points
- Real, extended bodies can undergo rotation, vibration, etc. in addition to translational motion
- The diver experiences parabolic translational motion and rotational motion
- Motion that is not pure translational = general motion

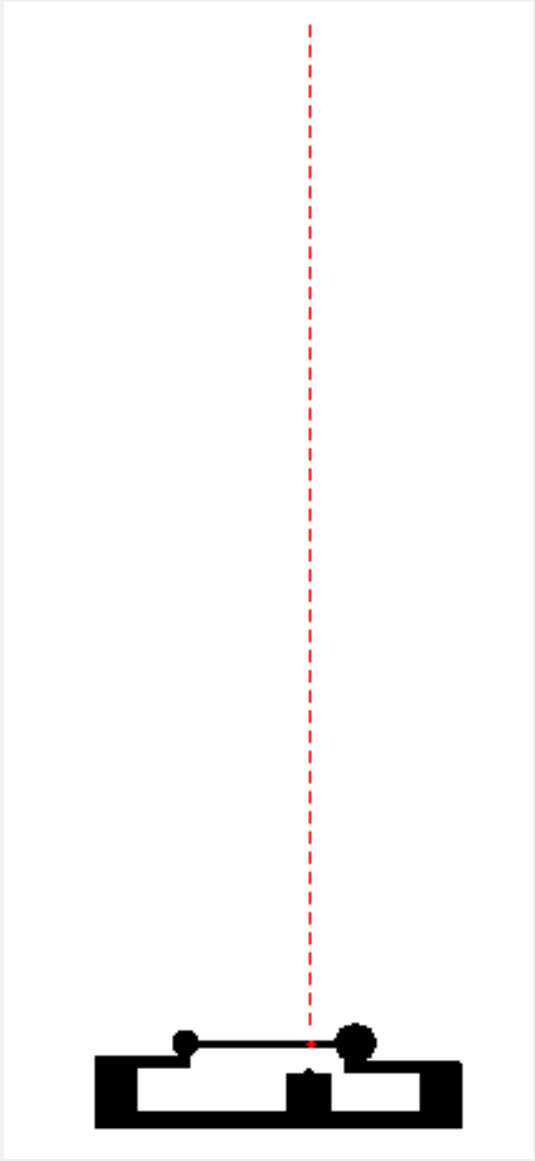


CENTER OF MASS

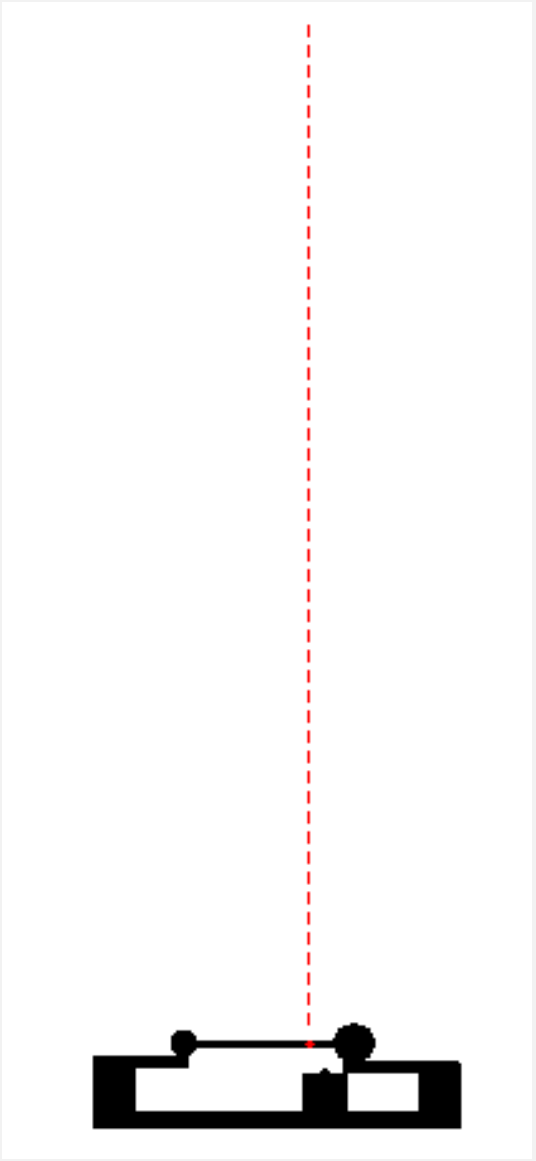
- Center of mass (COM) is the point where:
  - All mass is considered "concentrated"
  - Net force can be applied without causing object to rotate
  - Object can be balanced
  - The greater the surface area, the more stable the object



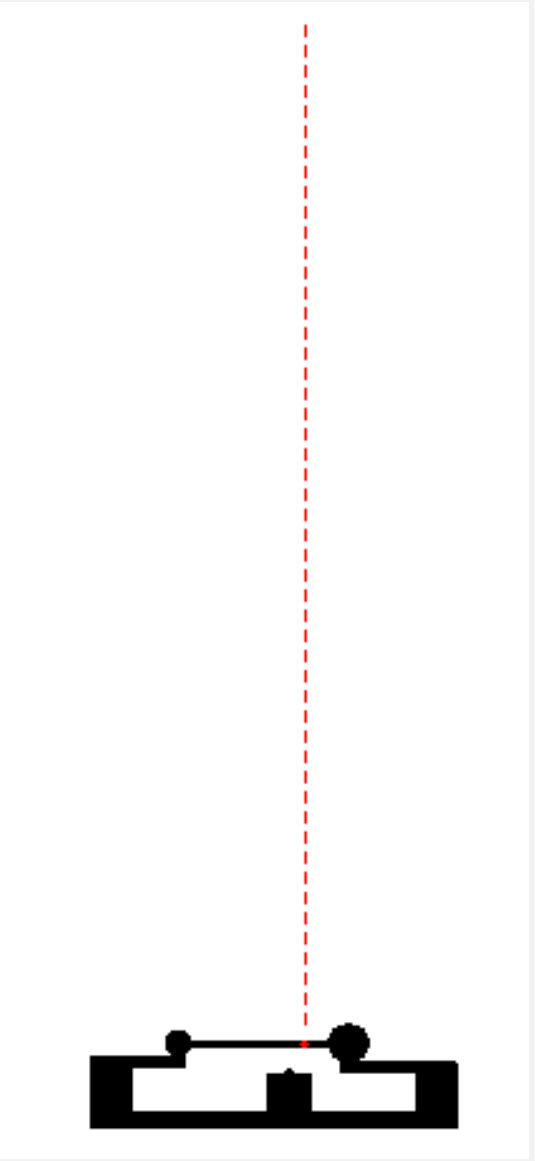
F on COM



F right of COM



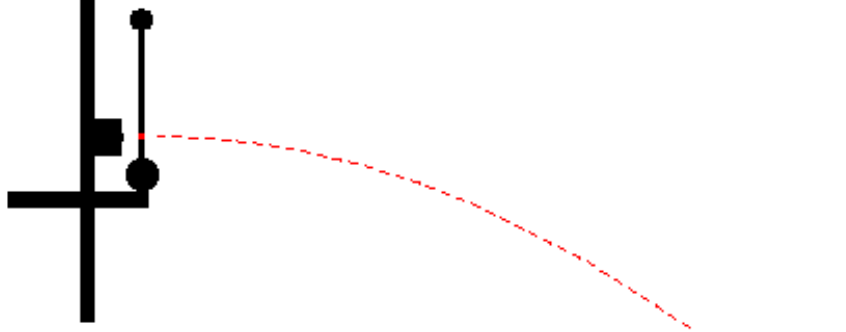
F left of COM



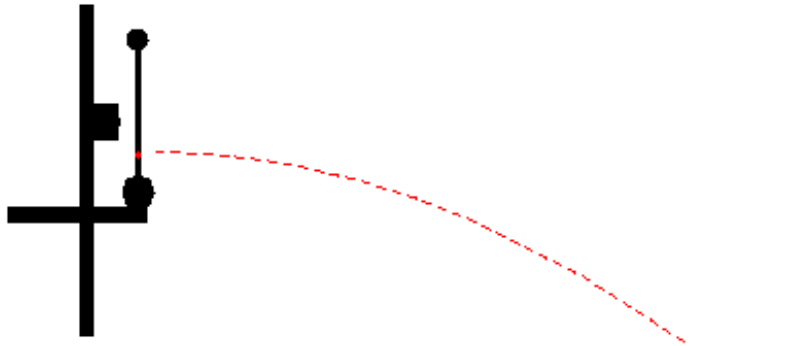
http://www.acs.psu.edu/drussell/Demos/COM/com-a.html

CENTER OF MASS: 2D MOTION

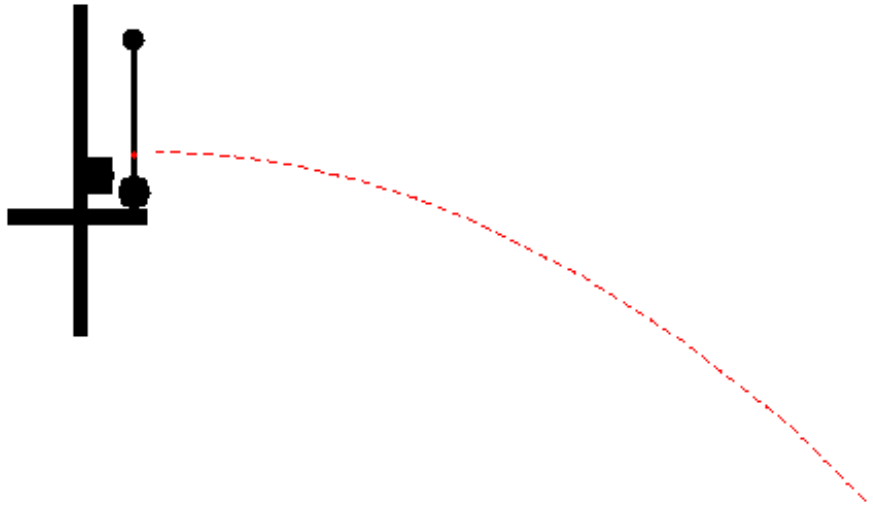
F on COM



F above COM



F below COM



http://www.acs.psu.edu/drussell/Demos/COM/com-a.html

CENTER OF MASS (COM)

For objects in 2 or 3 dimensions, you would need to find the center of mass in the x, y, and z directions

COM doesn't need to be inside the object in question!

COM is often found experimentally

CENTER OF GRAVITY (CG)

Center of Gravity (CG) is the point at which the force of gravity can be considered to act

Usually the same point as CM

When would CM not be the same as CG?

If an object is so large that the gravitational field around it isn't uniform…