

Goals

1. To be introduced to balancing forces and centripetal force.
2. To calculate various forces.

Balanced Forces

1. Sit on the floor. Are you moving? What does that say about the net force acting on you?
2. Is gravity acting on you? Where does the "balancing" force come from? What is the magnitude of this force? Give a value in Newtons.
3. This "support force" is really what we're talking about when we talk about apparent weight. If someone is trying to lift you up with a force of 20 N, what is the support force acting on you now?
4. It's the support force that we use (for N) when calculating friction. Remember Asa's box of bricks from last week? If it requires 1000 N of force to move the box at a constant speed, what is the coefficient of friction between the box and the floor?

$F=ma$

5. If a California Screamin' train with passengers weighs 22,000 lbs, what force is required to propel the train at the beginning of the ride? Where does this force come from? (Hint: you might need your solution to last week's hw for the acceleration of California Screamin'.)
6. Is it true that, when you drop from a branch to the ground below, you pull upward on Earth? If so, then why is the acceleration of the Earth not noticed?

Centripetal force

Any force acting toward a fixed center is called a centripetal force. This force is represented by $F = mv^2 / r$, where r is the radius of the circular path and v is the velocity (whose magnitude does NOT change, only its direction).

7. Draw a dotted line indicating the object's path. Draw an object (any object) at some point on that path. Draw an arrow indicating the direction of the force that causes the object to change direction (remember, this is a form of acceleration).
8. Estimate the radius of curvature for a cup on the Mad Tea Party. Let's say you want to spin once per second. What centripetal force is required?
9. Why are roller coaster tracks banked on a turn?

Rides

- Kugel Ball near Space Mountain, Golden Zepher, Mark Twain, Davy Crockett Canoes, California Screamin', Jungle Cruise (backside of water), Mad Tea Party