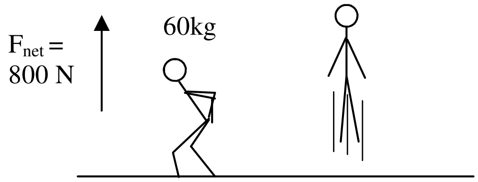
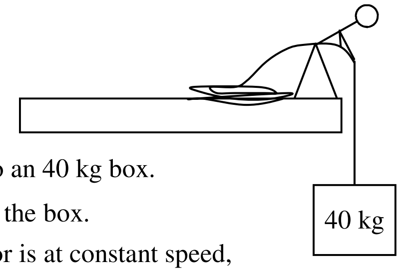
Due Thurs., Nov 1

2012 PreAP Forces 8

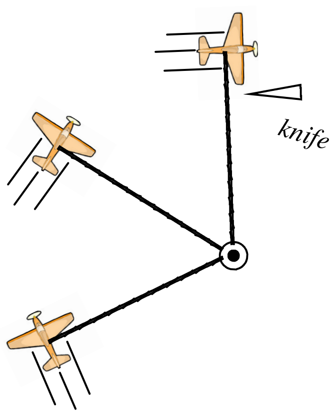


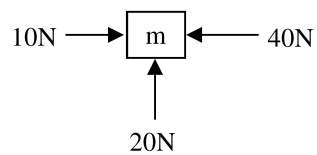
1. * In jubilation, Slim Jim jumps straight up into the air. His **net force** is 800 N.
   A. What is his weight?
   B. What must be the force of Jim on the floor?

   C. What is his acceleration?



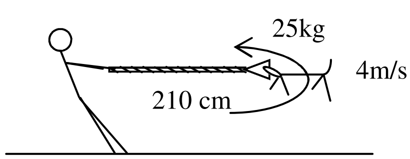
2. Slim Jim has a rope attached to an 40 kg box.
   A. Draw a force diagram for the box.
   B. If the box is not moving or is at constant speed,
      i. what is it's acceleration?
      ii. what is the tension in the rope?
   C. Which is bigger: Jim pulling on the rope or the rope pulling on Jim?
   D. * If Slim Jim pulls the object up with an acceleration of 2.5 m/s^2, find the tension in the rope.





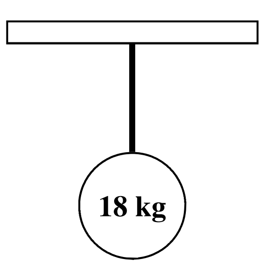
3. The diagram shows three forces are acting on an object. We are looking down on it.
   A. Draw and label the direction of the net force.
   B. Draw and label the direction of the acceleration.
   C. Which way is the object moving?

4. A toy plane attached to a rope is flying in a circle around a pole.
   A. What force is holding onto the plane?
   B. For each position draw and label the direction of the plane's velocity and acceleration.
   C. What kind of acceleration is this?
   D. At one point a knife cuts the rope. Draw the path that the plane will follow after the rope is cut.



5. Slim Jim's dog Bim has an amazing bite force. While biting onto a rope, Jim twirls him around in a circle. The dog is moving at constant speed around Jim.
   A. * Since $a_{centripetal} = v^2/r$, calculate the Bim's acceleration.

   B. What force provides this acceleration?
   C. Now that you have the acceleration, calculate the force keeping Bim in the circle (this is the tension in the rope).



6. An 18 kg object is suspended by a rope.
   A. What is the acceleration of the object?
   B. What is the tension in the rope?

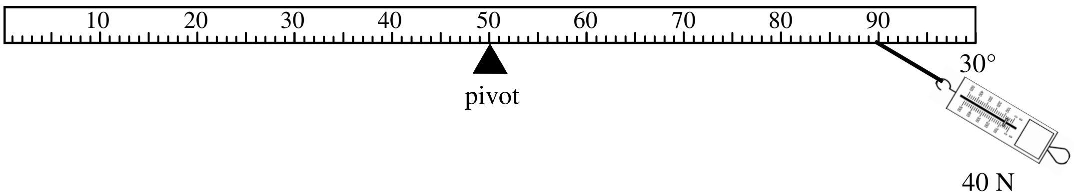
1000 g = 1 kg = 2.2 pounds (lbs). And, obviously, the weight of 1 kg = 10 N. But what is a newton? Let's find out.

7. * An apple is has a mass of about 200 g. Calculate its weight.

8. Imagine a person of 150 lbs.
   A. Convert this to kilograms.

   B. Convert this to Newtons.

More on back

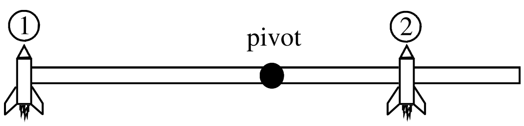


9. A 40 N force pulls on a lever as shown above.
   A. * What is the distance from the pivot in meters?
   B. Using the given equation, calculate the torque on the lever.

Torque

$$\tau = Fd\sin\theta$$

- Torque (*in Nm*) → τ
- Force (*in N*) → F
- Distance from pivot to where the force is attached (*in m*) → d
- Angle between force and the lever (*in º*) → θ



10. Two small rockets are attached to a pivoting rod. Rocket 2 is closer to the pivot than rocket 1.
    A. When only rocket 1 is on (rocket 2 is off), does the rod pivot clockwise (CW) or counterclockwise (CCW)?
    B. When only rocket 2 is on, what is the direction of the rod's motion: CW or CCW?
    C. Which rocket will provide more torque (assuming they have equal thrust [equal force])?
    D. If the rod starts at rest and the rockets are turned on at the same time, which way does th rod turn: CW or CCW?

1) 13.3 m/s^2 Hint: never add to a net force. By definition F_{net} = all of the forces added up already.
2D) 500 N
5A) 7.6 m/s^2 Remember if in a circle at constant speed, $a_{centripetal} = v^2/r$

7) 200g = 0.2 kg Fw = 0.2(10) = 2 N
9) * 40 cm = 0.4 m