2011 PreAP Forces 10

$F_{net} =$ 800 N

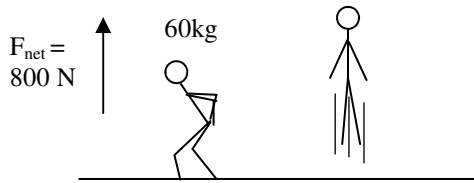60kg

1. * In jubilation, Slim Jim jumps straight up into the air. His net force is 800 N.
    A. What is his weight?
    B. 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/s², find the tension in the rope.

40 kg

10N → m ← 40N

20N
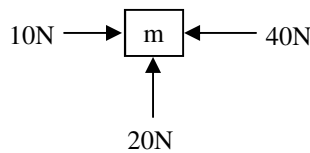
3. The diagram shows three forces are acting on an object. We are looking down on it.
    A. Draw and label the direction of the net force.
    B. Draw and label the direction of the acceleration.
   C. Which way is the object moving?
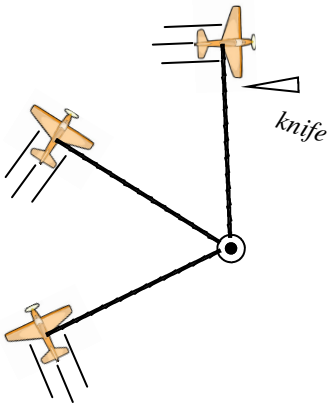
knife

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.
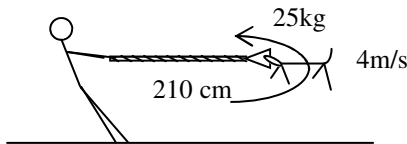
5. Slim Jim's dog Bim has an amazing bite force. While biting onto a rope, Jim twirls him around in a circle. The dog is moving at constant speed around Jim.
    A. * Calculate the Bim's acceleration.

    B. Calculate the force keeping Bim in the circle.

25kg

4m/s

210 cm
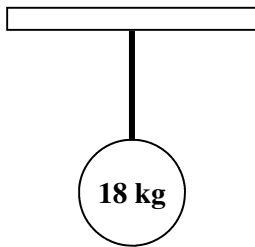
18 kg

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?

10 N

← 1.2 m → ← 1.1 m → ← 1.0 m →

30°

pivot

25 N

20 N

30 N
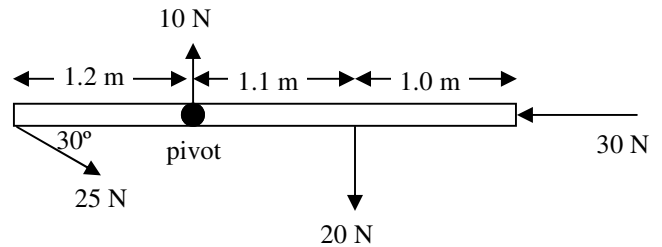
7. * Calculate the net torque on the lever above.

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) −7Nm