2009 Forces 8

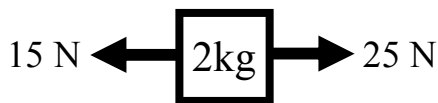*This homework does not cover the entire test. Please rework the Test Review and the last two homeworks.*

1. Slim Jim is walking his dog Bim, when they come across a stray cat, named Prim. Bim in his canine enthusiasm, accelerates toward Prim, dragging Jim at 1.3 m/s^2.   Jim is 60kg and there is 8N of friction.
    A. Draw a force diagram for Jim.
    B. What is Jim's weight?
    C. What is the normal force acting on Jim?
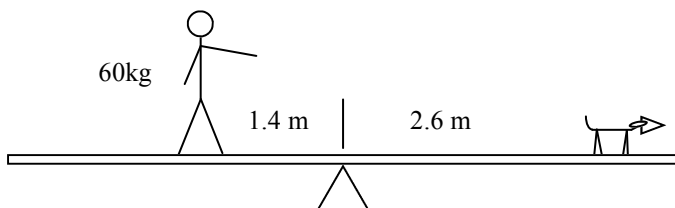   D. How much tension is in the rope?

2. Slim Jim discovers a new rocket propulsion system and travels all the way to Neptune.
    Jim is 90 kg in his space suit. Neptune has a mass of 1.03×10^{26} kg and a radius of 2.48×10^7 m.
    A. What is Jim's mass (with suit) when he is in space between the earth and Neptune?
    B. What is Jim's weight on the earth (with suit)?
    C. What is Jim's mass on Neptune?
    D. What is Jim's weight on Neptune?
        (*Use the "Gravity" notes.*)
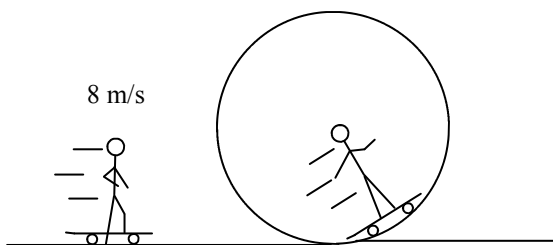
15 N ← **2kg** → 25 N

3. We are looking down on the above mass. All the forces are shown.
    A. What is the net force acting on the object?
    B. What is the acceleration of the object?

    C. How could the object be moving to the left?

    D. How could the object be moving to the right?

    E. How could the object be moving up?

    F. How could the object have a velocity of 0m/s?

    G. Which way does the acceleration point?

    H. So, which way must it be moving?

4. Slim Jim and Bim end up at the park and balance on the see-saw.   Jim is 60 kg, of course.
    A. If the see-saw stays balanced, who has more weight?

    B. Who is giving more torque?

    C. What is Jim's weight?
    D. Calculate the torque Jim gives.

    E. Calculate Bim's weight and mass.

60kg
1.4 m   2.6 m

8 m/s

5. Slim Jim is skateboarder and a big fan of Tony Hawk.
   Slim Jim tries a loop-the-loop which has a radius of 2 m.
   A. How much centripetal acceleration will he have when he
      starts around the loop?

   B. What is the centripetal force on Jim (you know his mass)?

   C. Which way does the acceleration point?
   D. Which way does his velocity point?