Homework: Ch 4

1. Draw a free body diagram for the two situations below:

2. What is the difference between an external and internal force? Can an internal force accelerate a body? Why or why not?

3. What exactly is the Normal force?

4. Can a force directed in the *x*-direction cause acceleration in the *y*-direction? Why or why not?

5. Given that the gravitation force on a body is proportional to a body's mass, if we neglect air resistance, why doesn't a heavy body fall more rapidly than a light body?

6. Is your mass the same on both Earth and the moon (g_{moon} = 1.6 m/s^2)? What about your weight? Justify your answers.

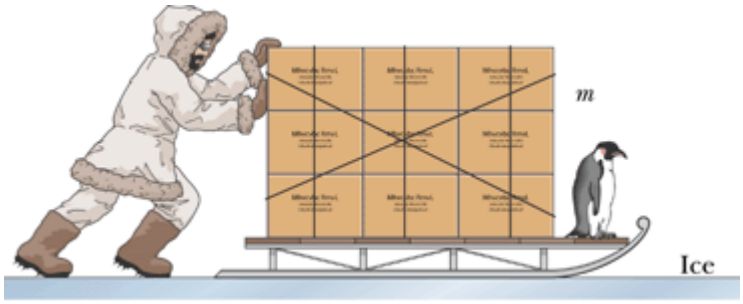
7. A 104 kg man wants to be able to go skydiving. If the maximum weight that the parachute can take is 225 lbs, can the man go sky diving?

8. A vertical force, F_{app}, is applied to a block of mass m that lies on a floor. What happens to the magnitude of the normal force on the block from the floor as the applied force, F_{app}, is increased from zero up to some value and applied in the downward direction? What if the applied force is in the upward direction?

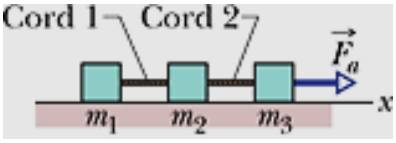
9. A block of mass *m* rests on a horizontal surface and is accelerate by means of a massless horizontal cord that passes over a frictionless pulley to a hanging mass, *M*. Assume the horizontal surface is frictionless. How far has the hanging mass fallen when it reaches a speed *v*?

10. A small ball of mass 0.30 g is suspended from a massless cord. A steady horizontal breeze pushes the ball so that the cord makes a constant angle of 37º with the vertical. Find the magnitude of the force on the ball from the breeze.

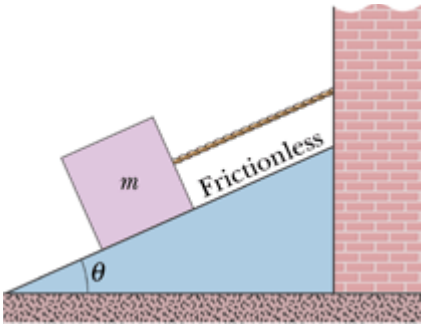
11. An Eskimo (with cleated boots) pushes a loaded sled of mass m = 240 kg through a displacement of magnitude d = 2.3 m along an x axis, over the frictionless surface of a frozen lake. The Eskimo's applied force on the sled is horizontal and has magnitude of 130 N, and the sled starts from rest. What is the sled's velocity at the end of the displacement?



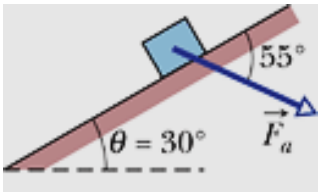
12. In the figure to the right, a force $\mathbf{F_a}$ of magnitude 32.0 N is applied to a train of blocks that move together along an x axis on a frictionless floor. The tension T_2 in cord 2 is 20.0 N. The masses of blocks 1 and 2 are m_1 = 2.00 kg and m_2 = 3.00 kg. What is the mass m_3 of block 3?



13. In the figure below, a cord holds a 15 kg block stationary on a frictionless plane inclined at angle $\theta = 27°$. What are the tension in the cord and the normal force on the block from the ramp?



14. In the figure to the right, a force is applied to a box of biscuits located on a frictionless plane inclined at θ = 30º. The box



has mass m = 5.00 kg and the applied force is at angle of 55º and has magnitude F_a = 50.0 N. What is the acceleration of the box along the inclined plane?

15. Two blocks are sitting side by side on a frictionless table such that the blocks are in contact with each other. A horizontal force is applied to block *A* causing both block *A* and *B* to move down the table. If the mass of block *A* is 2.3 kg and the mass of block *B* is 1.2 kg and F = 3.2 N, find the magnitude of the force between the two blocks.

16. Three blocks of masses m_1, m_2, and m_3 are connected together by massless cords with constant lengths. There is no friction between m_1 and the surface on which it slides. The pulley is also massless and frictionless.
    a. Why is it important to be told that the cords are massless and at a constant lengths?
    b. Draw the free body diagram for each block.
    c. Write the vector equation of motion (Newton's 2nd Law) for each of the three blocks; separate them into component equations for the *x*-direction and the *y*-direction.
    d. Solve these equation to determine the tension in the cord between block 2 and 3 in terms of m_1, m_2, m_3, and g.