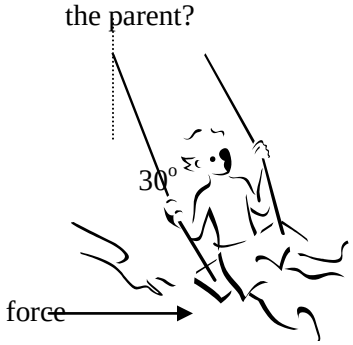
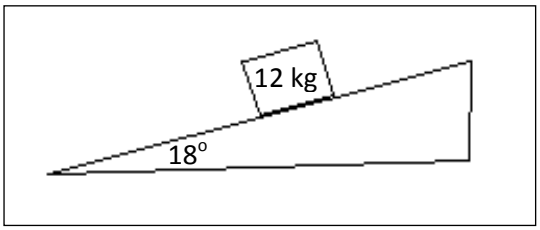
Pre-AP Physics: Forces in Equilibrium Problems

1. A child on a swing weighs $2.00 \cdot 10^{2}$ N. A parent momentarily holds the child to one side of a swing so that both of the swing's ropes are at an angle of 30.0° with the vertical. Treat the child and the swing as one object and the combined tension in the two sections of rope as one force.
    a. Draw the free body diagram for the child/swing
    b. In such a condition of static equilibrium, what is the horizontal force being applied by the parent?



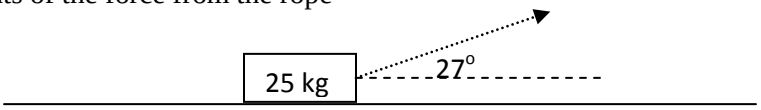
2. A carton, with a mass of 12 kg is resting on a ramp that makes an angle of 18^{0} with the horizontal.
    a. On the diagram, draw and label all the forces acting on the block. Do not include components of the forces.
    b. What is the force of gravity (weight) on the carton?
    c. What are the magnitudes of the components of the carton's weight
    <u>parallel to the ramp:</u>

    <u>perpendicular to the ramp:</u>

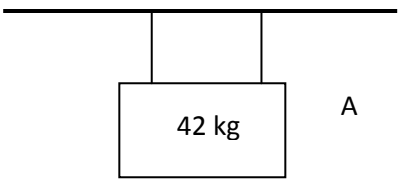


    (d) If the carton remains stationary on the ramp, what is the value of the force of static friction?

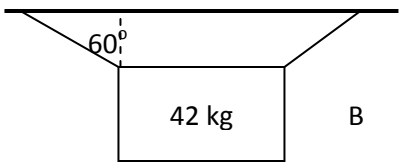
3. A 25 kg crate is pulled across a level floor at a constant speed by a force of 96 N from a rope making an angle of 27° with the horizontal. On the diagram, draw and label all the forces acting on the crate. Do not draw components of any forces. Calculate:
    a. the gravitational force acting on the crate
    b. the vertical and horizontal components of the force from the rope
    c. the normal force from the surface
    d. the force of kinetic friction



4. A heavy sign with a mass of 42 kg is supported by two cables as shown in diagram A. Calculate:
    a. the gravitational force acting on the sign
    b. The tension in each of the two cables
    c. The cords are now rearranged so that they make a 60° angle with the vertical as shown in diagram B. Calculate the tension in each cable in this case.



A



B