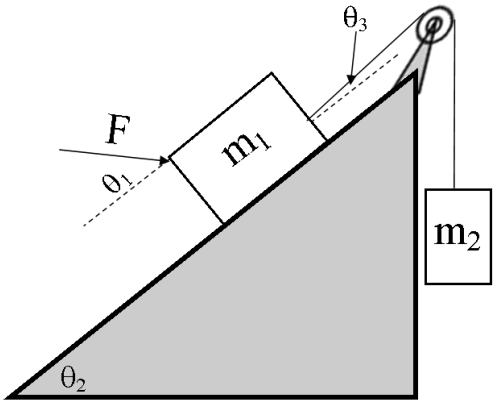
Name:_____ Date:_____

Mr. Croom's Physics Chapter 4: Force and the Law of Motion

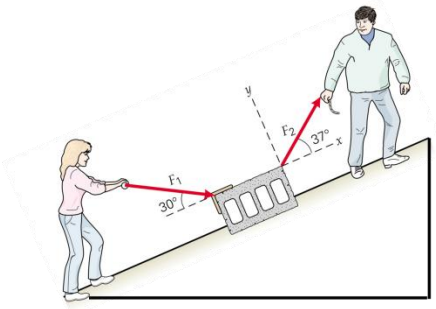
Advanced Force Problems 3

Solve the following problems

1. If m_1= 20 kg, m_2=45kg, F= 10N, θ_1=20°, θ_2=40°, and θ_3=10°, μ_k = 0.35 what is the acceleration of the system?



2. Two people try to move a 35kg block with the coefficient of friction of 0.88 up 25° incline. If the force that each person is exerting is the same, what force do they exert? What are the effects of each of their forces?



3. A physics book is motionless on the top of a table. If you give it a hard push with your hand, it slides across the table and slowly comes to a stop.
   a. Why does the book remain motionless before the force of your hand is applied?

   b. Why does the book begin to move when your hand pushes hard enough?

   c. Why does the book eventually come to a stop?

4. My car, with a mass of 1000 kg, is stuck in the mud. I get out and push from the back of the car with a force of 4000 N. My car is still stuck. My friend gets out, and helps me push. He pushes with a force of 6000 N. The car finally moves at a constant velocity out of the mud.
    a. Draw a free body diagram, labeling all the forces involved in the situation.

    b. With how much frictional force is the mud exerting on the car?

    c. What is the net force on the car?

    d. If instead, while pushing the car, it accelerates with an acceleration of 3 m/s^2, what is the net force on the car? What is the force of friction on the car?

    e. As we are pushing the car (Based on the data in d), we accidentally forget about a nearby cliff that is 5 meters away. (We aren't smart). It falls off the 20 m high cliff, moving horizontally, how far from the cliff does it land?

    f. What is its velocity as it hits the ground?

5. You exert 200 N on your refrigerator and push it across the kitchen floor at constant velocity.
    a. What is the friction force that acts between the floor and the frig?
    b. Is this friction force the reaction force to your push? Explain.

6. What is the net force on an apple that weighs 2 N when it is at rest above your head? What is the net force on it when you release it? (these are different!)

7. When a car moves along a highway at constant velocity, the net force must be zero. Why, then, does the engine continue to burn fuel?

8. Can an object round a curve without any force acting on it? Explain.

9. Consider a book that weighs 15 N at rest on a flat table. How many newtons of support force does the table provide? What is the net force on the book?

10. If we find an object that is not moving even though we know it to be acted on by a force, what inference can we draw?

11. Solve for the acceleration of the system if m_1=10 kg, m_2=25 kg, m_3=18 kg, m_4= 12 kg, θ_1=8º, θ_2=15º, θ_3=22º, θ_4=29º, F_1=40 N, μ_1=0.2, μ_3=0.35.