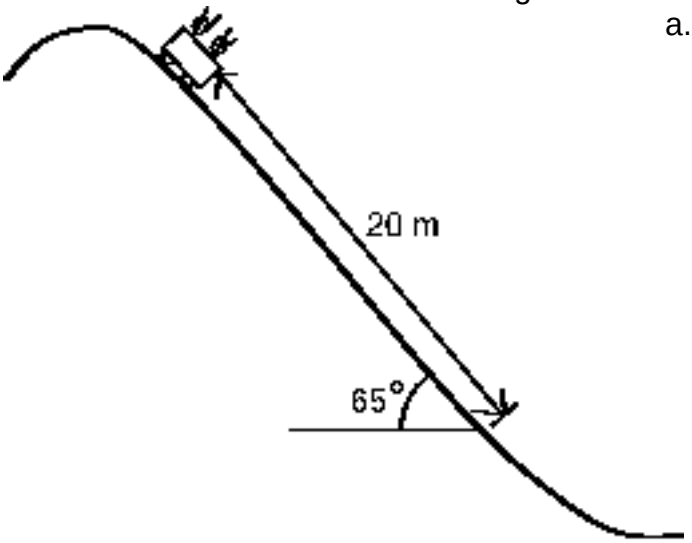
Name_____

Date _____Pd____

Unit 4 Worksheet 4:

1. A rollercoaster car, 300 kg with passengers, accelerates down a 65° hill. We will assume that friction is small enough that it can be ignored.



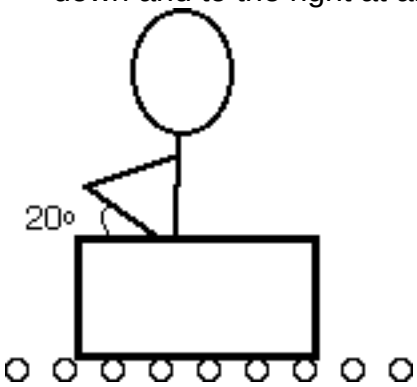
   a. Draw a force diagram for the system of car and riders.

   b. Determine the value of the component of the gravitational force parallel to the hill.

   c. What is the acceleration of the rollercoaster down the hill?

   d. If they are traveling 4 m/s at the time shown in the picture, how fast will they be traveling at the end of the straight stretch, 20 m later?

2. A worker pushes a 7 kg shipping box along a roller track. Assume friction is small enough to be ignored because of the rollers. The worker's push is 25 N directed down and to the right at an angle of 20°.



a. Draw a force diagram for the block.

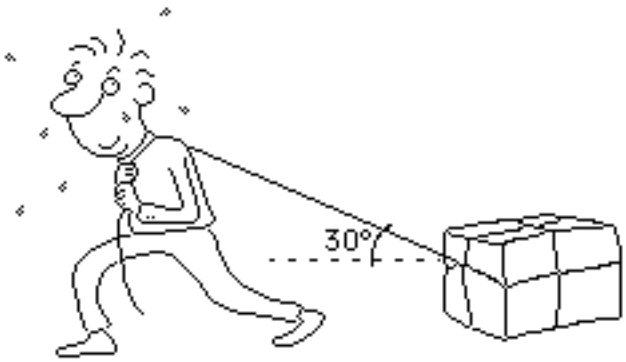
b. Determine the horizontal-component of the worker's push.

c. Write a net force equation for the horizontal forces on the block.

d. Determine the acceleration of the block.

e. Determine the normal force on the block.

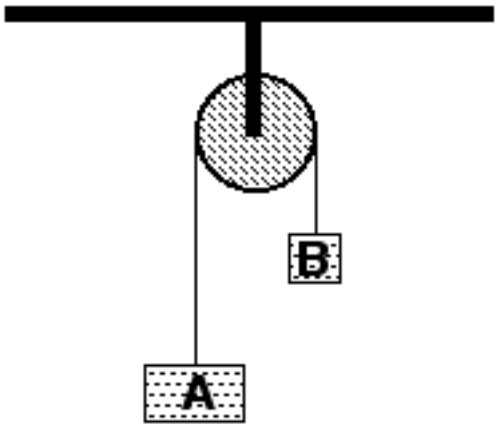
3. A 70 kg box is pulled by a 400 N force at an angle of 30° to the horizontal. The force of kinetic friction is 75 N.



a. Draw a quantitative force diagram for the box.

b. Determine the acceleration of the box.

4. Below is a picture of an Atwood's Machine: two masses attached to a frictionless, massless pulley (pretty neat how physicists dream up equipment like this, huh?). The mass of block A is 5.0 kg, and the mass of B is 2.0 kg.



a. Determine the acceleration of the system when the blocks are released.

b. How long will it take for block A to fall 2.0 m?

5. Two friends are parked 10.0 m from the edge of a cliff in a car whose mass, including that of the occupants is 1000 kg. A jealous suitor ties a rope to the car's bumper and a 50 kg rock to the other end of the rope. He then lowers the rock over the edge of the cliff, and the car, which is in neutral, accelerates toward the edge. (Note the similarity to the modified Atwood's machine lab, and ignore frictional effects.)
   a. Draw force diagrams for the rock and the car:

   b. Determine the acceleration of the car towards the edge.

   c. How long do the friends have to apply the brakes before they go over the edge?