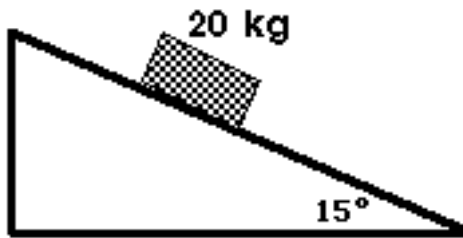


UNIT 3 WORKSHEET 8:

1. A 500 kg mass in deep space (gravitational forces are negligible) experiences forces in a single plane as shown below.



- a. Determine the net force acting on the mass.
- b. Determine the acceleration of the mass.
2. A 20 kg mass is allowed to accelerate down a *frictionless* 15° ramp.

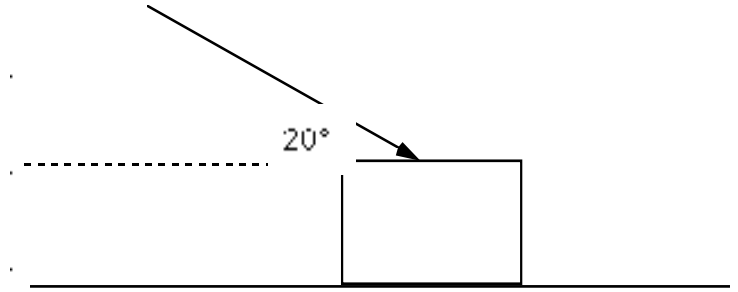


- a. Draw a force diagram for the block

- b. Determine the value of the x-component of the force of gravity.
- c. What is the acceleration of the block down the ramp?
- d. How long will it take for the block to slide 30.0m if the block started from rest?

3. An applied 25 N force pushes on a 5.0 kg block resting on a *frictionless* horizontal surface. The force is directed downwards at an angle of 20° .

a. Draw a force diagram for the block.



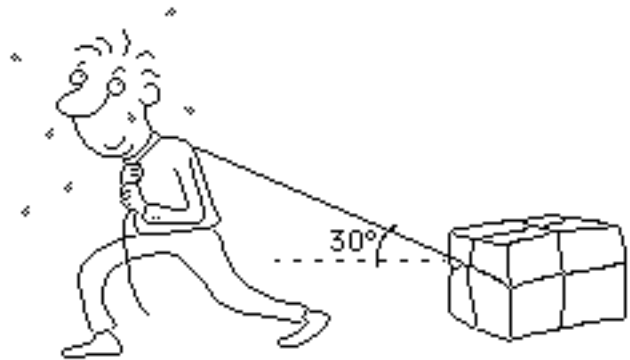
b. Determine the x-component of the applied force.

c. What is the acceleration of the block?

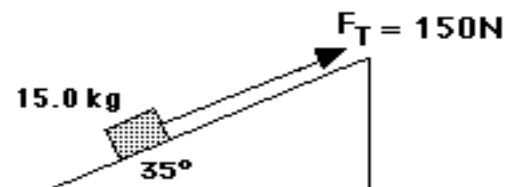
d. What is the normal force on the block?

4. A 70.0 kg box is pulled by a 400. N force at an angle of 30° to the horizontal. The force of kinetic friction is 75.0 N. Draw the force diagram for the box.

What is the acceleration of the box?



5. A block is connected to a string as shown in the diagram to the right. Assume that the ramp is *frictionless*. Draw the force diagram for the block on the ramp.



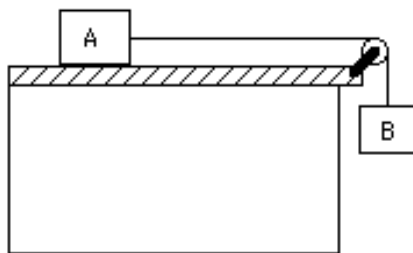
a. What is the x-component of the force of gravity acting on the block on the ramp?

b. What is the acceleration of the block?

6. Repeat problem 5, except now, assume that the frictional force acting on the block on the ramp is 25.0 N.

Challenging Problems → 2-body problems similar to the lab

7. A 20 kg block (A) rests on a frictionless table; a cord attached to the block extends horizontally to a pulley at the edge of the table. A 10 kg mass (B) hangs at the end of the cord.



a. Clearly draw and label the force vectors acting on each object.

b) Calculate the acceleration of the block and mass.

c) Calculate the tension in the cord.

8. Two lovers 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.

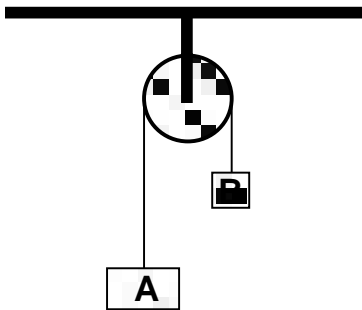
a) Draw a force diagram; label the forces acting on the rock and car.

b) What is the acceleration of the car towards the edge?

c) How much time do the lovers have before they go over the edge?

9. 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. Clearly draw and label the force vectors acting on each object.

b. What is the acceleration of the system when the blocks are released?

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