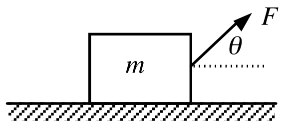
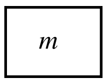
AP Physics 1
Force Practice Problems Test 5

1.) 

A 45 kg box is pulled across the floor with a force of 220 N at a 53.13° angle as shown in the figure to the left. The coefficient of kinetic friction between the floor and box is 0.15.

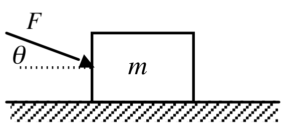
a.) Draw a force diagram.



b.) Write net force equations for the box.

c.) Find the frictional force.

d.) Find the acceleration of the box.

2.) 

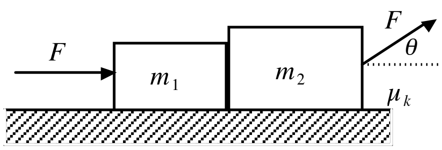
A 25 kg box is pushed across the floor with a force of 180 N at a 36.87° angle as shown in the figure to the left. The coefficient of kinetic friction between the floor and the box is 0.10.

a.) Draw a force diagram.

b.) Write net force equations for the box.

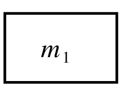
c.) Find the frictional force.

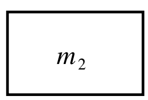
d.) Find the acceleration of the box.

3.) 

In the figure to the left, F = 10 N, θ = 53.13°, μ_k = 0.20, m_1 = 1.0 kg, and m_2 = 2.0 kg. Vertical contact surfaces between the two blocks are frictionless.

a.) Draw free-body diagrams for both blocks.



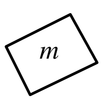


b.) Write net force equations for both blocks.

c.) Find the acceleration of the system and the force that the larger block exerts on the smaller block.

4.) A 24.5 N block is released from rest on a 36.87° inclined plane. The coefficient of kinetic friction is 0.25.

a.) Draw a free-body diagram for the block.



b.) Write net force equations for the block.

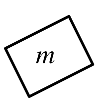
c.) Find the component of the block's weight that is parallel to the incline.

d.) Find the component of the block's weight that is perpendicular to the incline.

e.) Find the acceleration of the block.

A force of 25 N (parallel to the incline) is applied to the block and the block slides up the incline.

f.) Draw a free-body diagram for the block.



g.) Write net force equations for the block.

h.) Find the acceleration of the block.

5.) A 35 kg block is on an inclined plane that makes an angle of 53.13˚ with respect to the horizontal. The coefficient of kinetic friction is 0.20.

a.) Find the component of the block's weight that is parallel to the incline.

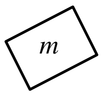
b.) Find the component of the block's weight that is perpendicular to the incline.

A force is (parallel to the incline) is applied to the block so that the block slides down the incline at a constant velocity.

c.) Draw a free-body diagram for the block.

d.) Write net force equations for the block.

e.) Find the magnitude of the force.

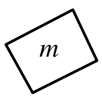


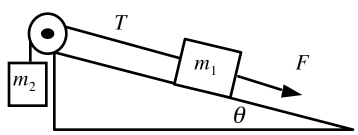
A force is (parallel to the incline) is applied to the block so that the block slides up the incline with an acceleration of 2.0 m/s^2?

f.) Draw a free-body diagram for the block.

g.) Write net force equations for the block.

h.) Find the magnitude of the force.



6.) 

In the figure to the left, m_1 = 15 kg and m_2 = 25 kg and the coefficient of kinetic friction between m_1 and the incline is 0.25. A force F = 235 N is applied to block m_1 and this force is parallel to the incline for which θ = 36.87˚.

a.) Draw a free-body diagram for each mass.

b.) Write net force equations for each mass.

c.) Find the parallel and perpendicular components of the weight of mass m_1.

d.) Find the acceleration a and the tension T in the connecting cord.

7.) A string connected to a 0.15 kg ball that is being swung in a horizontal circle with a radius of 0.6 meters, the ball makes two revolutions every second and is moving at a constant speed..

a.) Find the tangential speed of the ball.

b.) How much tension is in the string?

8.) A 0.150 kg ball on the end of a 1.10 m long cord (negligible mass) is swung in a vertical circle.

a.) Draw a force diagram for the ball at the top of the circle.

b.) Determine the minimum speed the ball must have at the top of its arc so that it continues to move in a circle.

c.) Draw a force diagram for the ball at the bottom of the circle.

d.) Calculate the tension in the cord at the bottom of the arc assuming the ball is moving at twice the speed of part (b.).

9.) Bebop tries to cross a river by swinging from one bank to the other on a vine that is 10.0 m long. Her speed at the bottom of the swing, just as she clears the surface of the river, is 8.0 m/s. Bebop does not know that the vine has a breaking strength of 80 N. If Bebop's mass is 5.5 kg will she safely reach the other side of the river?

10.) A person with a mass of 60 kg is riding on a Ferris wheel with a diameter of 15 m.

a.) Draw a force diagram for the person at the top of the ride.

b.) At what speed would the Ferris wheel need to rotate for the person to feel "weightless" at the top of the ride?

c.) Draw a force diagram for the person bottom of the ride.

d.) Using the speed found in (b), what would be the apparent weight of at the the person at the bottom of the ride?

11.) A 55 kg person is riding on a roller coaster loop with a diameter of 24 m and moving at a constant speed of 15 m/s.

a.) Draw a force diagram for the person at the top of the loop.

b.) How much force would the person feel against their rear-end at the top of the ride?

c.) Draw a force diagram for the person at the bottom of the loop.

d.) How much force would they feel at the bottom of the loop?

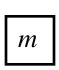
12.) A roller coaster engineer designs a coaster so that the minimum "safe" velocity of the car at the top of the loop is 14 m/s.

a.) What is the radius of the loop?

b.) What is the apparent weight of a 65 kg passenger at the top of the loop if speed is 20 m/s?

13.) A 2000 kg car rounds a circular turn of radius 20.0 m. The road is flat and the coefficient of static friction between the tires and the road is 0.70.

a.) Draw a force diagram for the car as it rounds the turn.



b.) How fast can the car go without skidding?

14.) A 13,500 N car traveling at 15 m/s rounds a curve of radius 200 m. Find the following:

a.) the force that maintains the constant acceleration.

b.) the minimum coefficient of static friction between the tires and the road that will allow the car to round the curve safely.