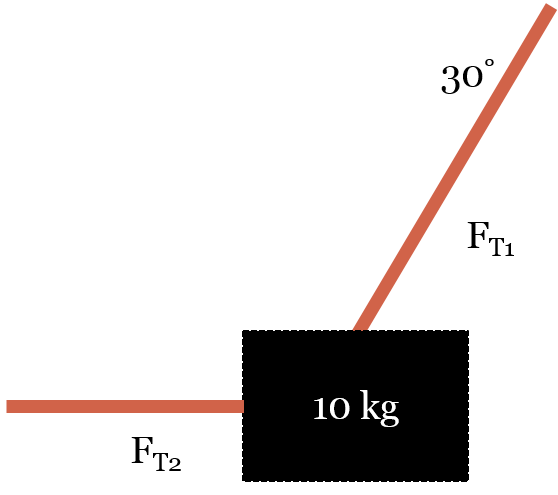
1. Define the following:
   1. Newton’s First Law
   2. Newton’s Second Law
   3. Newton’s Third Law
2. Give an example of each of Newton’s Three Laws of Motion
3. Short answer
   1. Explain why, in space, an astronaut throws a wrench and he then accelerate backwards.
   2. A horse pulls on a cart with a force of 20N. With what force does the cart pull on the horse?
   3. A child sits stationary in a chair, and the force of gravity pushes the child down with a force of 35N. With what force does the chair push on the child.
   4. A car’s engine exerts a force that causes the wheels of the car to grip the ground and push off to propel the car forward. Explain how this is an example of Newton’s Third Law.
4. Solve the following:
   1. A man hits a golf ball (0.2 kg) which accelerates at a rate of 20 m/s2. What amount of force acted on the ball? [4N]
   2. You give a shopping cart a shove down the isle. The cart is full of groceries and has a mass of 18kg. The cart accelerates at a rate of 3 m/s2. How much force did you exert on the cart? [54N]
   3. The wind pushes a paper cup along the sand at a beach. The cup has a mass of 25 grams and accelerates at a rate of 5 m/s2. How much force (in Newtons) is the wind exerting on the cup? [0.125N]
   4. You push a friend sitting on a swing. She has a mass of 50 kg and accelerates at a rate of 4 m/s2. Find the force you exerted. [200N]
   5. How much force would it take to push another, larger friend who has a mass of 70 kg to accelerate at the same rate of 4 m/s2? [280N]
   6. A worker drops his hammer off the roof of a house. The hammer has a mass of 9 kg, and gravity accelerates it at the usual 9.8 m/s2. How much force does the earth apply to the hammer? [88.2N]
   7. A car whose mass is 1000 kg is traveling at a constant speed of 10 m/s. Neglecting any friction, how much force will the engine have to supply to keep going the same speed? [0N]
5. Solve the following:
   1. A box of mass 10kg is pulled on a level surface by a rope parallel to the surface. The rope exerts 28N of force. The surface has coefficients of friction μk=0.14 & μs=0.21.
6. Create a free body diagram for the situation
7. Does the box move? If so, with what acceleration?  
     
     
     
     
     
   1. A box of mass 40kg is pulled on a level surface by a guy parallel to the surface. The rope exerts 144N of force. The surface has coefficients of friction μk=0.31 & μs=0.48.
      1. Create a free body diagram for the situation
      2. Does the box move? If so, with what acceleration?
   2. A box of mass 25kg is pulled on a level surface by a rope parallel to the surface. The rope exerts 95N of force and the box accelerates at 0.95m/ss .
      1. Create a free body diagram for the situation
      2. What is the coefficient of friction for the surface?
   3. A box of mass 25kg is pulled on a level surface by a rope parallel to the surface. The rope exerts 95N of force and the box accelerates at 0.95m/ss .
      1. Create a free body diagram for the situation
      2. What is the coefficient of friction for the surface?
   4. A box of mass 10kg sits on a level surface, with coefficients of friction μs=0.22 & μk=0.13. It is pushed by a man at 50N an angle of 30˚ above the horizontal.
      1. Create a free body diagram for the situation.
      2. Does it move? If so, with what acceleration?
   5. A box of mass 15kg sits on a level surface. It is pushed by a man at 35N an angle of 40˚ above the horizontal and moves at a constant speed.
      1. Create a free body diagram for the situation.
      2. What is the coefficient of friction of the surface?
   6. A box of mass 10kg sits on a level surface, with coefficients of friction μs=0.41 & μk=0.29. It is *pulled* by a rope at a constant speed an angle of 25˚ above the horizontal.
      1. Create a free body diagram for the situation.
      2. What is the force of tension in the rope?
   7. A force of 50N is exerted to slide a 25kg mass *up* a ramp with an incline of 30˚ at a constant speed. What is the coefficient of kinetic friction of the surface?
   8. A 10kg mass sits on an incline of 35˚. It is held in place by static friction. What is the force of static friction acting on the mass?
   9. A 5kg mass sits on a 20˚ incline. The coefficients of friction for the incline are μs=.24 and μk=.16. Does the mass move? If so, with what acceleration?
   10. A 60kg box sits on an incline of 14˚. A rope pulls *up* the ramp with a force of 20N parallel to the ramp. The ramp has coefficients of friction μs=0.14 and μk=0.08. Which way does the mass move? With what acceleration?
8. Find the tension in the ropes below.

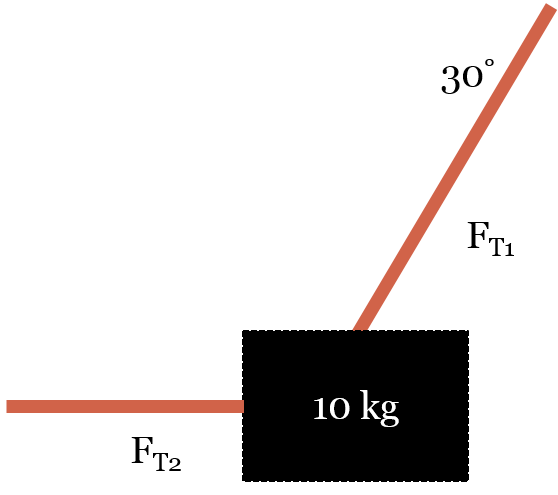






8kg

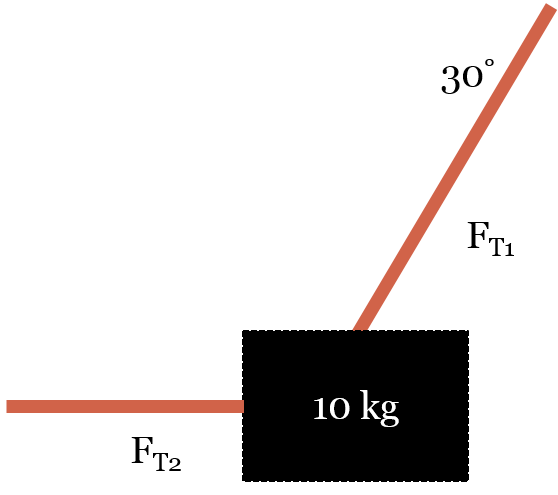
15˚



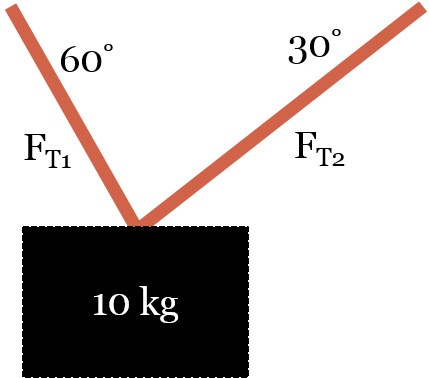




18˚



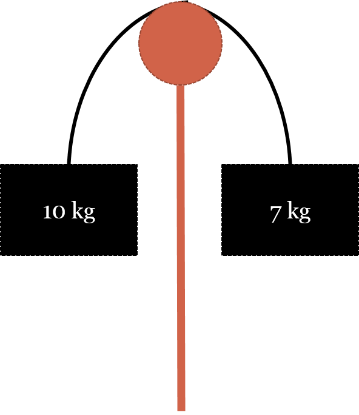
3kg

* 1. 

35˚

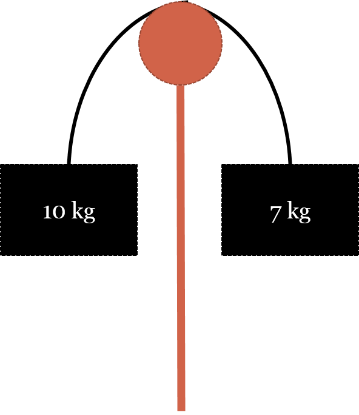
13˚

3kg

* 1. Find the tension in the rope and the acceleration of the system.

5kg

3kg

* 1. 
  2. find the tension in each rope

2kg

5kg

T1

T2

* 1. T1

14kg

23kg

10kg

T2

T3

* 1. Find the tension in the rope and the acceleration of the system (neglect friction)

1kg

3kg

10kg

3kg

20kg

14kg

2kg

1kg

Find m so asys=3m/s2

m

3kg

1kg

m

75kg

m

m

100kg

m

6kg

Assume uk=0.21 for all surface. Find m so a = 6m/s2

m

80kg

m

3kg