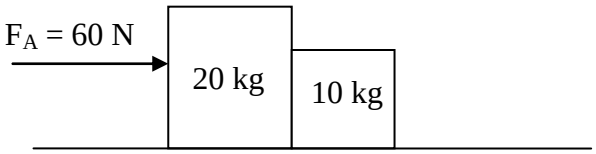
Section 16: Pulleys

1 A force of 60 N [E] acts on a combination of two boxes that are next to each other on a frictionless surface.

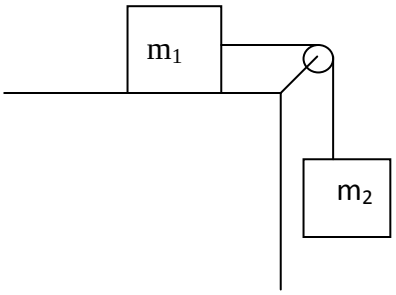


A) Find the acceleration of the boxes.

B) Find the force exerted by the 10 kg box on the 20 kg box.

C) Find the force exerted by the 20 kg box on the 10 kg box.

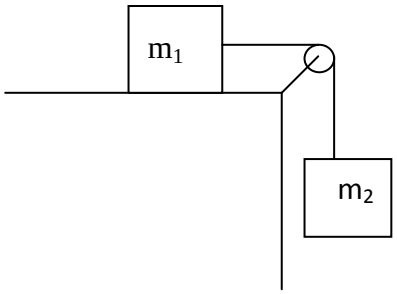
2 A 8.0 kg block (m_1) on a frictionless table is attached by a string to a 2.0 kg block (m_2). The string and the 2.0 kg block is lead over a pulley and hung over the edge of the table.



A) What would be the acceleration of the system when they are released?

B) What is the tension in the string?

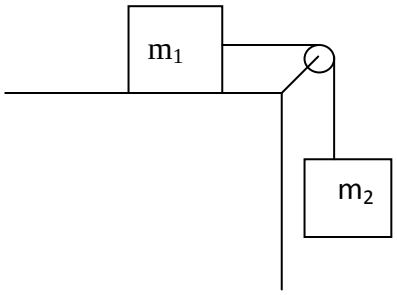
3 A 12 kg block (m_1) on a frictionless table is attached by a string to a 6.0 kg block (m_2). The string and the 6.0 kg block is lead over a pulley and hung over the edge of the table. The force of friction between the block and the table is 13.8 N.



A) What would be the acceleration of the system when they are released?

B) What is the tension in the string?

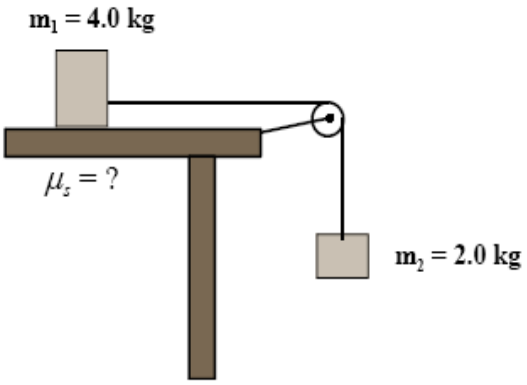
4 A 10.0 kg mass is attached by a string to a 5.0 kg mass. The string and the 5.0 kg mass is lead over the pulley and hung over the edge of the table. What would be the acceleration of the system when they are released if the coefficient of friction between the table and the 10.0 kg mass is 0.11? What is the tension in the string?



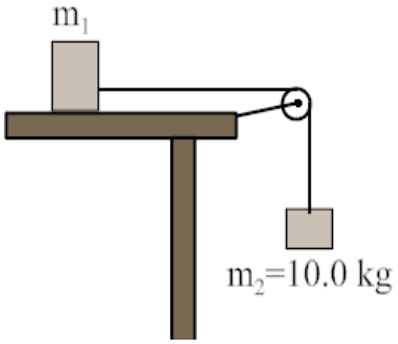
A) What would be the acceleration of the system when they are released?

B) What is the tension in the string?

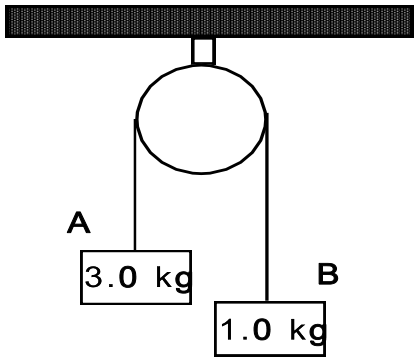
5 In the diagram below, two masses are connected by a light string over a frictionless massless pulley. What coefficient of static friction is required to keep m_1 from slipping?



6 In the diagram below, the tension in the string joining the two masses is 12.0 N. If friction is negligible, what is the mass of m1?



7 A 3.0 kg mass and a 1.0 kg mass are hanging over a frictionless pulley as shown in the diagram. What is the acceleration of the system? What is the tension in the rope?

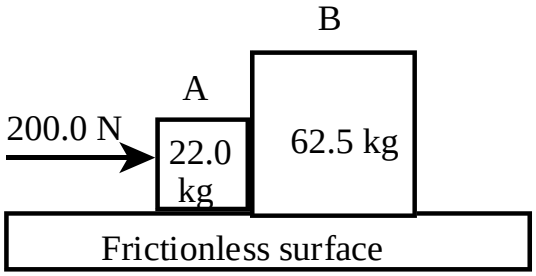


Worksheet 2 – Section 10

1. Two blocks are touching each other on a horizontal frictionless surface. Block A has a mass of 10.0 kg and block B has a mass of 6.0 kg. A force of 12 N is applied to block A in order to push the two blocks forward.

   A) What is the acceleration of the 'system' of two blocks?
   B) What force does block B exert on block A?

2. A) A force of 200.0 N is applied to the boxes as shown in the figure. Calculate the acceleration of the entire system.



   B) Use Newton's Third Law to find the force of Block B on Block A.

3. A 6.0 kg block on a table is attached by a string to a 3.0 kg block. The string and the 3.0 kg block is lead over a pulley and hung over the edge of the table.

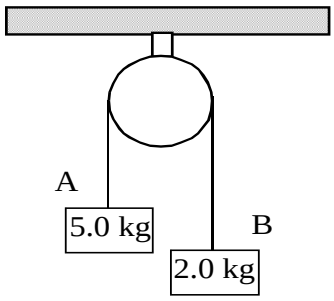
   A) What would be the acceleration of the system when they are released?
   B) What is the tension in the string?

4. A 10.5 kg mass is attached by a string to a 5.5 kg mass. The string and the 5.5 kg mass is lead over the pulley and hung over the edge of the table.

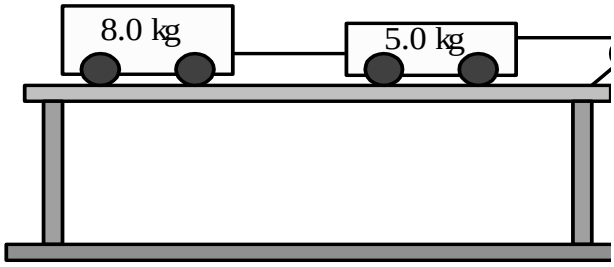
   A) What would be the acceleration of the system when they are released if the friction between the table and the 10.5 kg mass is 18.0 N?

   B) What is the tension in the string?

5. A 2.0 kg mass and a 5.0 kg mass are attached to a lightweight cord that passes over a frictionless pulley, as diagramed. What is the acceleration of the system and what is the tension in the cord?

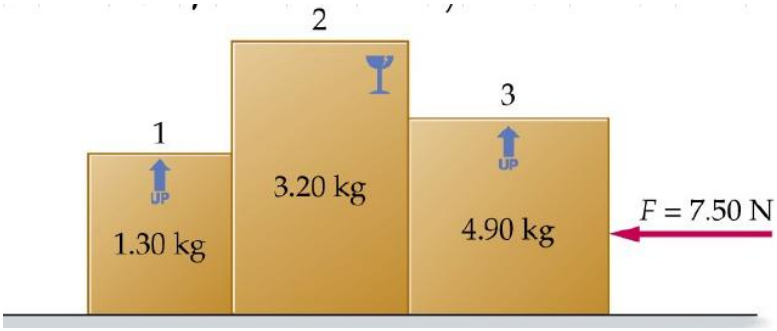


6. Two dynamics carts, with masses of 8.0 kg and 5.0 kg, are connected by strings on a horizontal, frictionless table. A 2.0 kg mass is connected as shown to the 5.0 kg cart. The pulley is assumed to be frictionless.



A) Determine the tension in the string between the 5.0 kg and 2.0 kg masses.
B) Determine the tension in the string between the 8.0 kg and 5.0 kg carts.

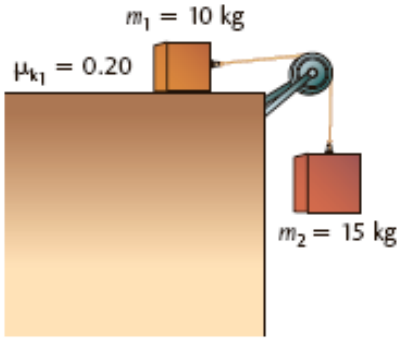
7. A force of magnitude 7.50 N pushes three boxes as shown. Find the force that box 2 exerts on box 3.



8. An Atwood machine consists of two masses, 5.0 kg and 7.2 kg, that are connected by a rope hanging over a pulley. When the two masses are released, what is the acceleration of the system?

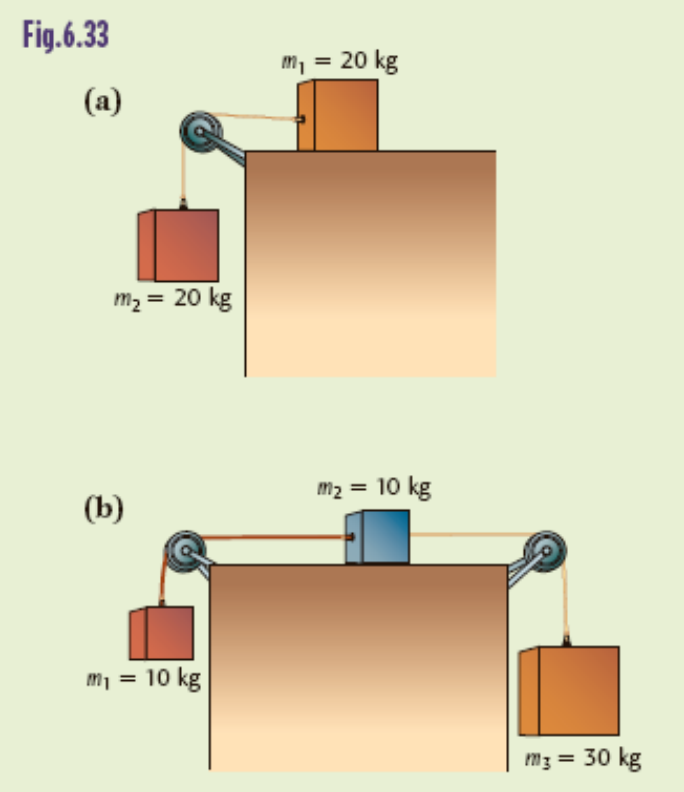
9. A dynamics cart, with a mass of 1.5 kg, is attached to a suspended mass of 1.3 kg by a string that passes over a pulley. If the coefficient of friction between the lab desk and the cart is 0.68, determine
A) the acceleration of the cart when the mass is released.
B) the tension in the string.

10. Determine the acceleration and the tension in each rope.



11 **A)** For each frictionless situation, determine the acceleration of the system and the tension in each rope.

B) Repeat for $\mu_k = 0.2$.



12 What coefficient of friction would be required to prevent the system from moving?