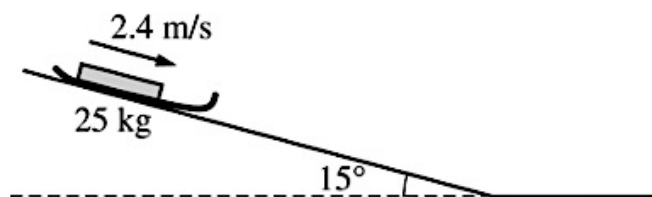


Homework for Chapter 2

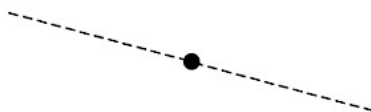
1. 2007-physics b-question 1



An empty sled of mass 25 kg slides down a muddy hill with a constant speed of 2.4 m/s. The slope of the hill is inclined at an angle of 15° with the horizontal as shown in the figure above.

(a) Calculate the time it takes the sled to go 21 m down the slope.

(b) On the dot below that represents the sled, draw and label a free-body diagram for the sled as it slides down the slope.



(b) Calculate the frictional force on the sled as it slides down the slope.

(d) Calculate the coefficient of friction between the sled and the muddy surface of the slope.

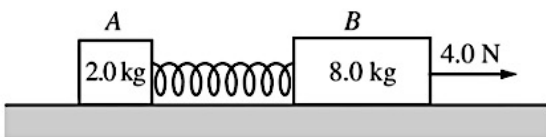
(e) The sled reaches the bottom of the slope and continues on the horizontal ground. Assume the same coefficient of friction.

i. In terms of velocity and acceleration, describe the motion of the sled as it travels on the horizontal ground.

ii. On the axes below, sketch a graph of speed u versus time t for the sled. Include both the sled's travel down the slope and across the horizontal ground. Clearly indicate with the symbol t_L the time at which the sled leaves the slope.



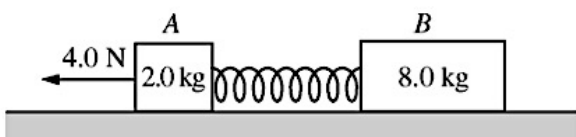
2. 2008-physics b-question 2



Block A of mass 2.0 kg and block B of mass 8.0 kg are connected as shown above by a spring of spring constant 80 N/m and negligible mass. The system is being pulled to the right across a horizontal frictionless surface by a horizontal force of 4.0 N, as shown, with both blocks experiencing equal constant acceleration.

- (a) Calculate the force that the spring exerts on the 2.0 kg block.
- (b) Calculate the extension of the spring.

The system is now pulled to the left, as shown below, with both blocks again experiencing equal constant acceleration.

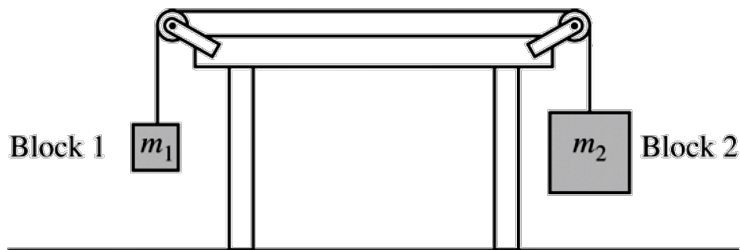


- (c) Is the magnitude of the acceleration greater than, less than, or the same as before? Greater Less The same

Justify your answer.

- (d) Is the amount the spring has stretched greater than, less than, or the same as before? Greater Less The same Justify your answer.

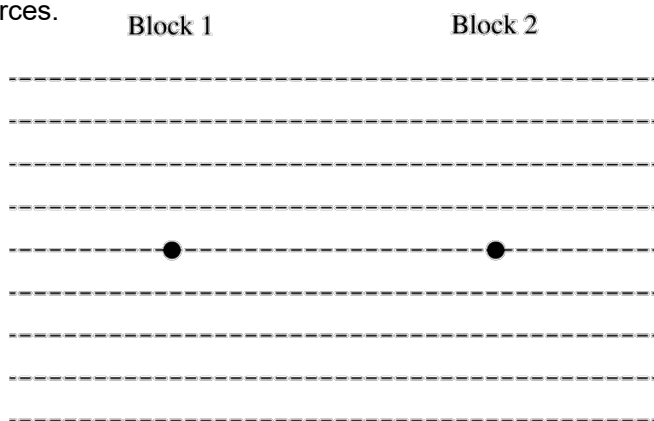
3. 2015-physics 1-FR-question 1 (7 points, suggested time 13 minutes)



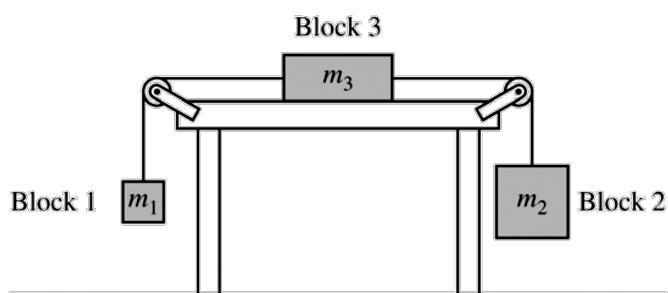
Note: Figure not drawn to scale.

Two blocks are connected by a string of negligible mass that passes over massless pulleys that turn with negligible friction, as shown in the figure above. The mass m_2 of block 2 is greater than the mass m_1 of block 1. The blocks are released from rest.

(a) The dots below represent the two blocks. Draw free-body diagrams showing and labeling the forces (not components) exerted on each block. Draw the relative lengths of all vectors to reflect the relative magnitudes of all the forces.



(b) Derive the magnitude of the acceleration of block 2. Express your answer in terms of m_1 , m_2 , and g . Block 3 of mass m_3 is added to the system, as shown below. There is no friction between block 3 and the table.



Note: Figure not drawn to scale.

(c) Indicate whether the magnitude of the acceleration of block 2 is now larger, smaller, or the same as in the original two-block system. Explain how you arrived at your answer.