

NORTHERN ILLINOIS UNIVERSITY
PHYSICS DEPARTMENT

Physics 210 – Mechanics & Heat

Spring 2021

Problem Set #7

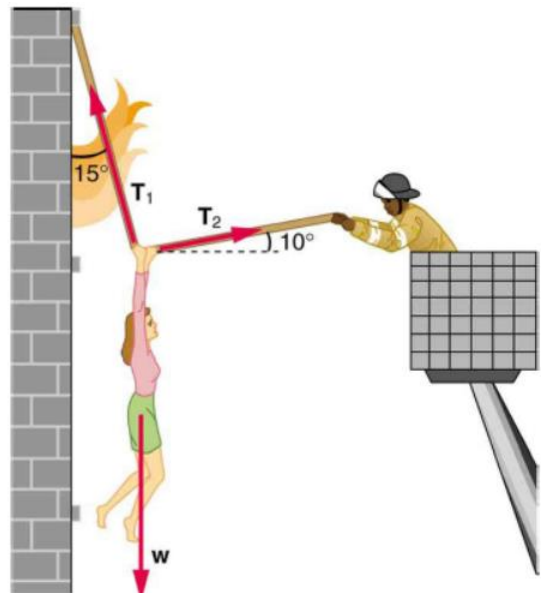
Problem Set Due: Thurs., March 4, 2021

Read OpenStax: Chapter 10.3, Lecture Notes #6b

There will be a Midterm Exam in class on Tues, March 9

Show explicitly all your work for full credit.

1. A 76.0 kg person is being pulled away from a burning building as shown above.
 - (a) Draw the free body diagram for the person. Draw a **large** diagram and *clearly show components* of any vectors that make an angle θ with the axes.
 - (b) Write down Newton's 2nd law for motion along the x and y-directions.
 - (c) Find the tensions, T_1 and T_2 , in the two ropes if the person is momentarily motionless.



Unfortunately, the rope the firefighter is holding suddenly snaps near his hands. Let the portion of the rope she hangs on with tension T_1 be 2 m long.

- (d) Draw the free body torque diagram for this situation. For your polar coordinate system, define the origin to be the point where the rope is attached to the wall.
 - (e) What is the magnitude of her angular acceleration immediately after the rope with tension T_2 snaps? (*assume she is a point mass*)

2. Expert TA: 12.2.2 show calculation and figure
3. Expert TA: 12.3.26 show calculation and figure
4. OpenStax: **Example 10.7** page 397 show figure and calculation

5. Three solid, uniform boxes are aligned as in Figure P8.10. Find the x - and y -coordinates of the center of mass of the three boxes, measured from the bottom left corner of box A.

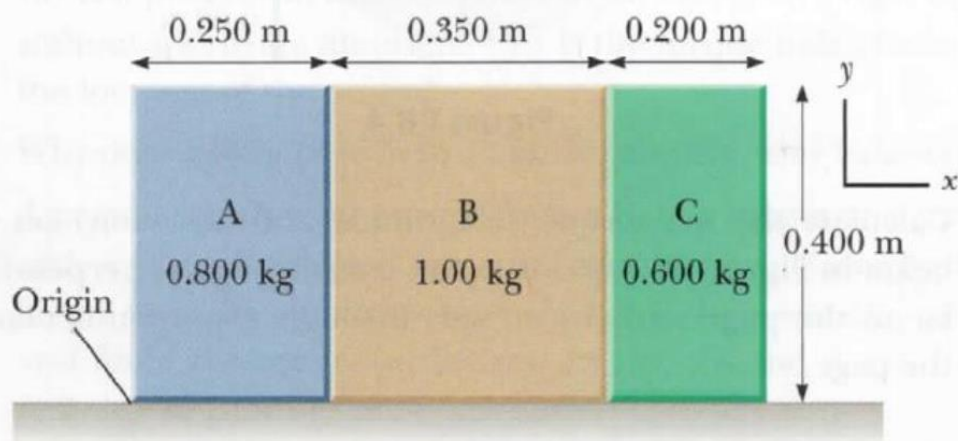
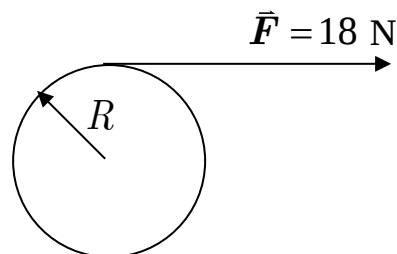


Figure P8.10



6. A disk can freely rotate about an axis going through its center. A force of 18 N is applied to the rim of the disk having a radius $R = 7.0 \text{ cm}$. If the mass of the disk is 2.4 kg, what is its angular velocity after 5.0 sec?