

# Announcements

- Echo360 is available to supplement lecture notes.

## ☐ Upcoming deadlines:

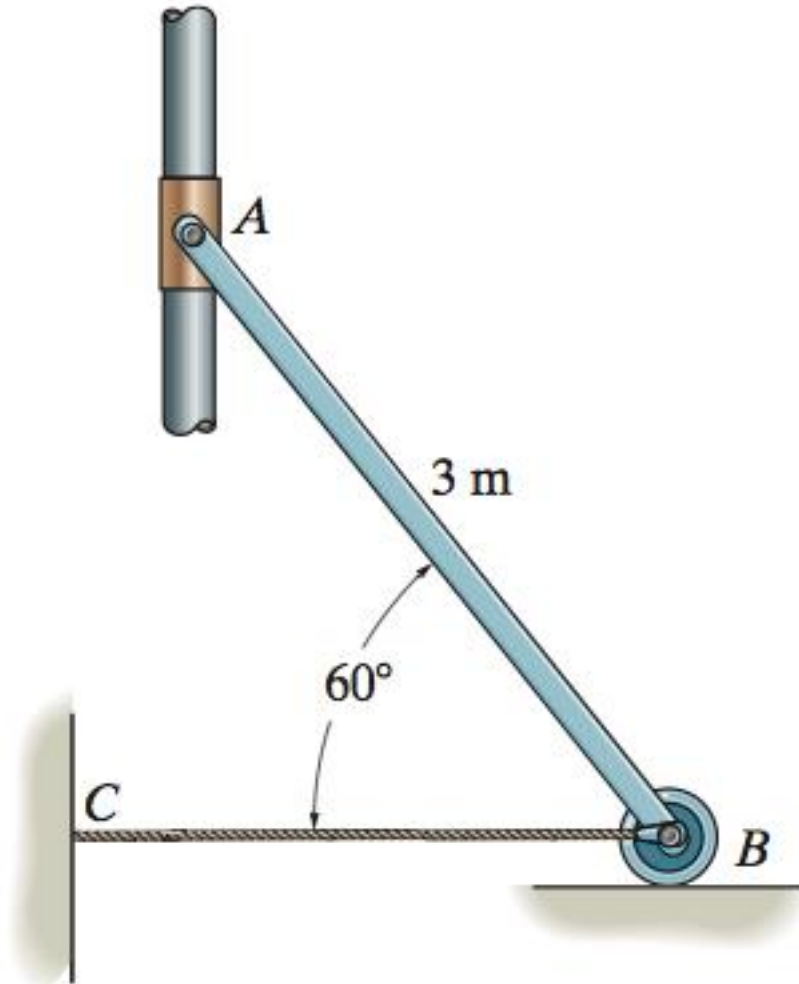
- Friday (10/5)
  - Written Assignment
- Tuesday (10/9)
  - PL HW



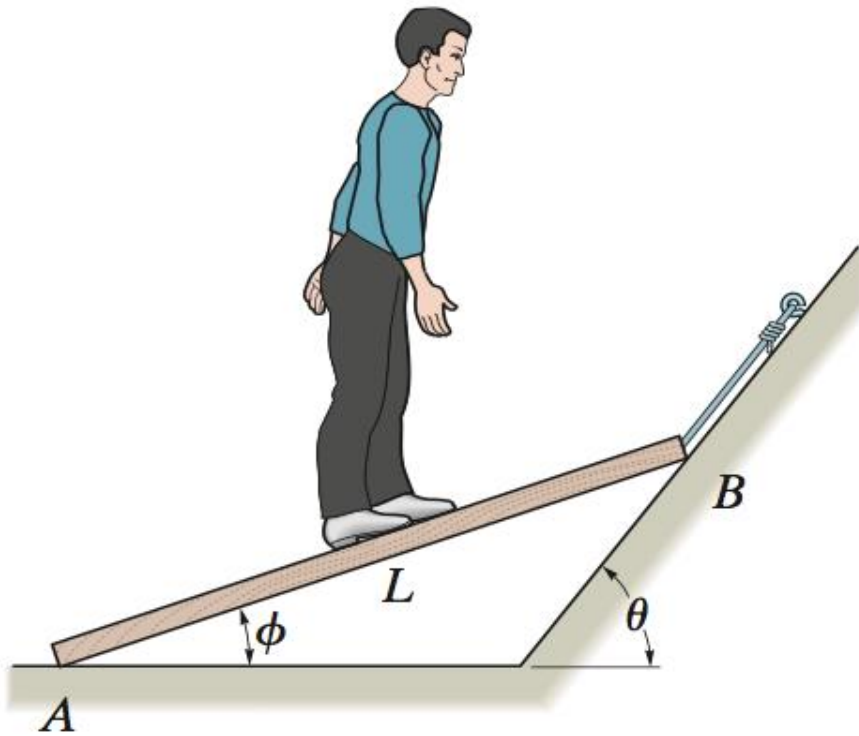
# Objectives

- 2D rigid body equilibrium examples
- 3D rigid body support reactions

The uniform rod  $AB$  has a mass of 40 kg. Determine the force in the cable when the rod is in the position shown. There is a smooth collar at  $A$ .



The man has a weight  $W$  and stands at the center of a plank with negligible weight. If the planes at  $A$  and  $B$  are smooth, determine the tension in the cord in terms of  $W$  and  $\theta$ .



# Equilibrium of a rigid body



Now we add the z-axis to the coordinate system!

What are the possible movements for a 3-D body?










# Equilibrium of a rigid body



Now we add the z-axis to the coordinate system!

6 Equations of Equilibriums:

**TABLE 5-2 Supports for Rigid Bodies Subjected to Three-Dimensional Force Systems**

Types of Connection	Reaction	Number of Unknowns
(1)  cable		
(2)  smooth surface support		
(3)  roller		

**TABLE 5-2 Supports for Rigid Bodies Subjected to Three-Dimensional Force Systems**


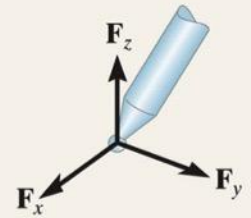


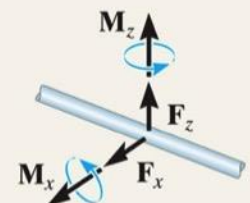

Types of Connection	Reaction	Number of Unknowns
<p>(4)</p>  <p>ball and socket</p>		
<p>(5)</p>  <p>single journal bearing</p>		



TABLE 5-2 Continued


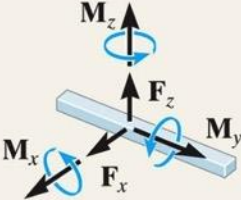


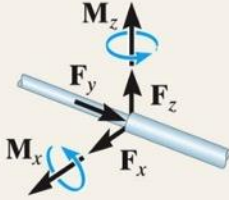


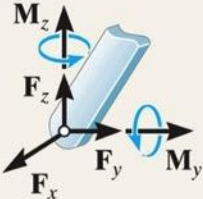


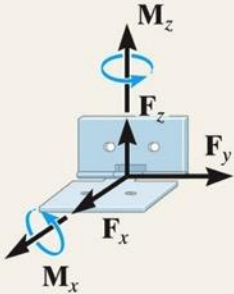


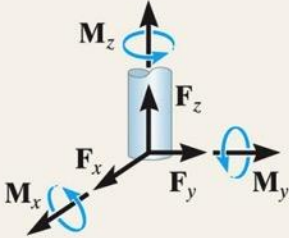
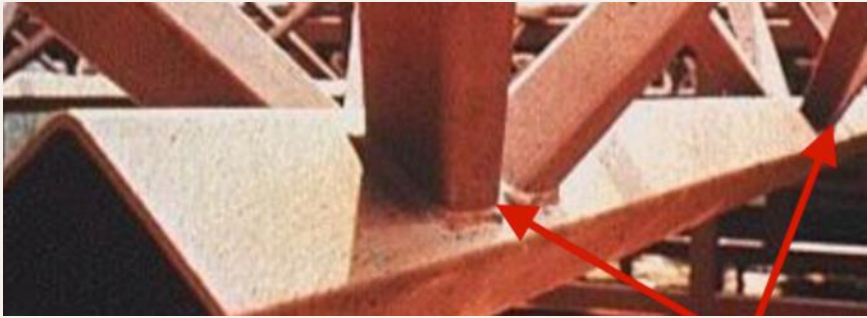
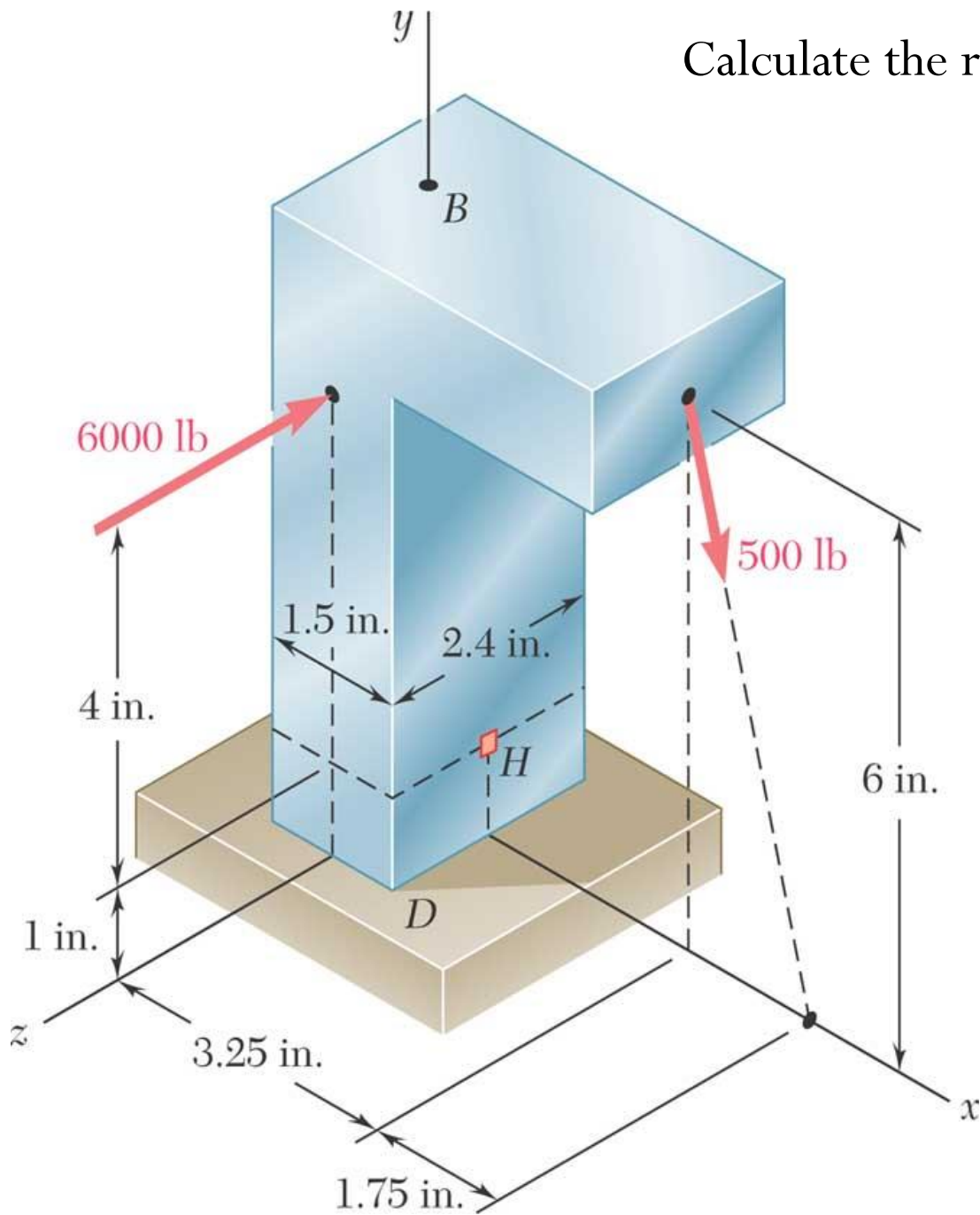
Types of Connection	Reaction	Number of Unknowns
<p>(6)</p>  <p>single journal bearing with square shaft</p>		
<p>(7)</p>  <p>single thrust bearing</p>		
<p>(8)</p>  <p>single smooth pin</p>		

TABLE 5-2 Continued

Types of Connection	Reaction	Number of Unknowns
<p>(9)</p>  <p>single hinge</p>		
<p>(10)</p>  <p>fixed support</p>		

Calculate the reaction forces at the support.



The 50-lb mulching has a center of gravity at  $G$ . Determine the vertical reactions at the smooth contact point  $A$ .

