

Statics - TAM 211

Lecture 35

April 16, 2018

Chap 5.5-5.6

Announcements

□ Upcoming deadlines:

- Monday (4/16)
 - Mastering Engineering Tutorial 14
- Tuesday (4/17)
 - PL HW 13
- Monday (4/23)
 - Mastering Engineering Tutorial 15
- Quiz 6
 - CBTF (4/25-27)
- Written Assignment 6
 - Wednesday May 2

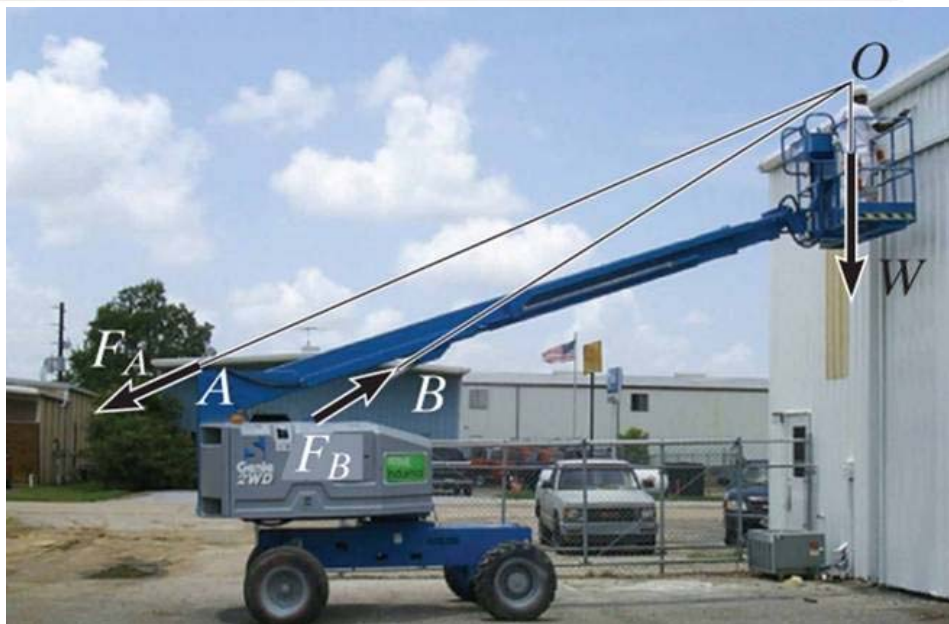
Chapter 5 Part II – 3-D Rigid Body

Chap 5.5-5.6


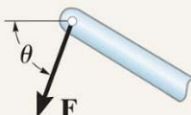
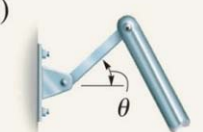
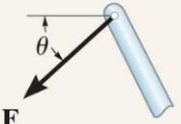
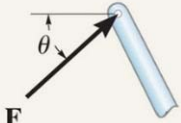

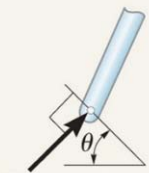

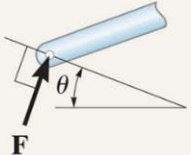
Equilibrium of a rigid body



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



Types of 2D connectors

Types of Connection	Reaction
(1)  cable	
(2)  weightless link	 or 
(3)  roller	
(4)  rocker	

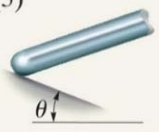
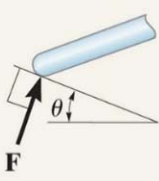

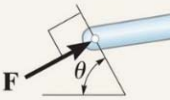
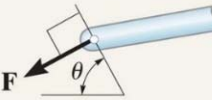

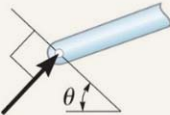
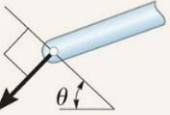
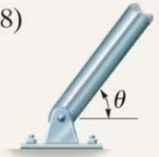
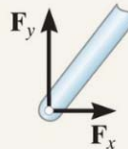


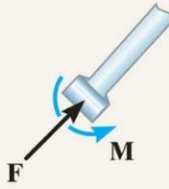

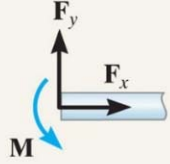
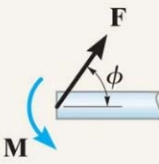
Types of Connection	Reaction
(5)  smooth contacting surface	
(6)  roller or pin in confined smooth slot	 or 
(7)  member pin connected to collar on smooth rod	 or 
(8)  smooth pin or hinge	 or 
(9)  member fixed connected to collar on smooth rod	
(10)  fixed support	 or 

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





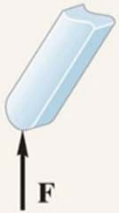





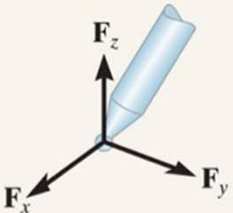


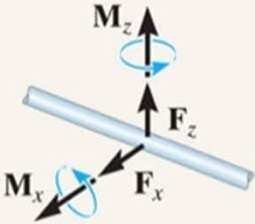

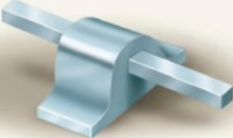
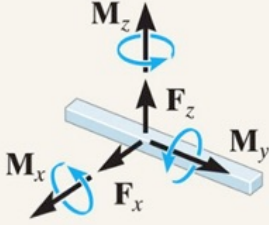


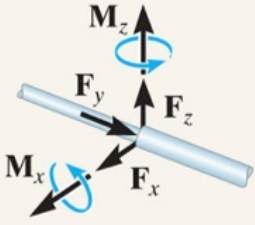


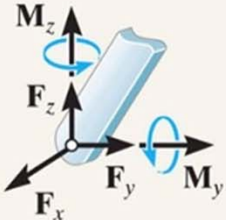


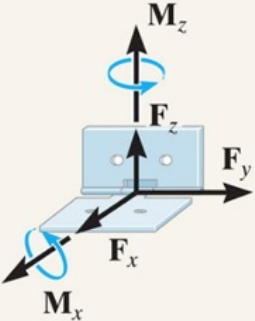


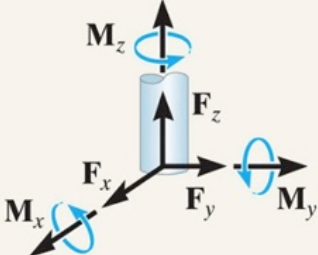
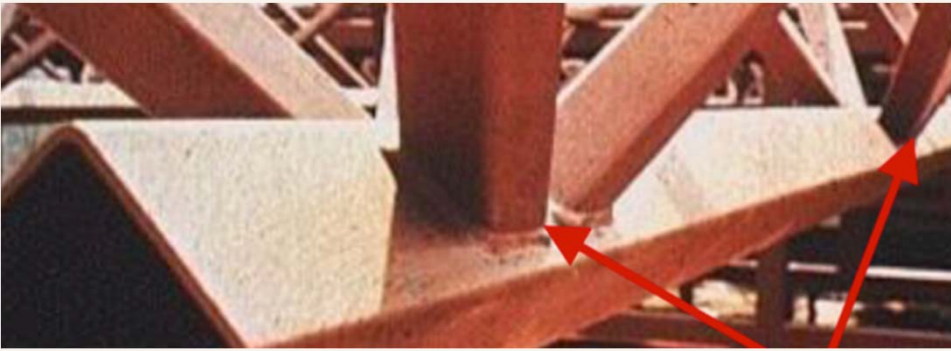
Types of Connection	Reaction	Number of Unknowns
<p>(1)</p>  <p>cable</p>		
<p>(2)</p>  <p>smooth surface support</p>		
<p>(3)</p>  <p>roller</p>		
<p>(4)</p>  <p>ball and socket</p>		

TABLE 5-2 Continued

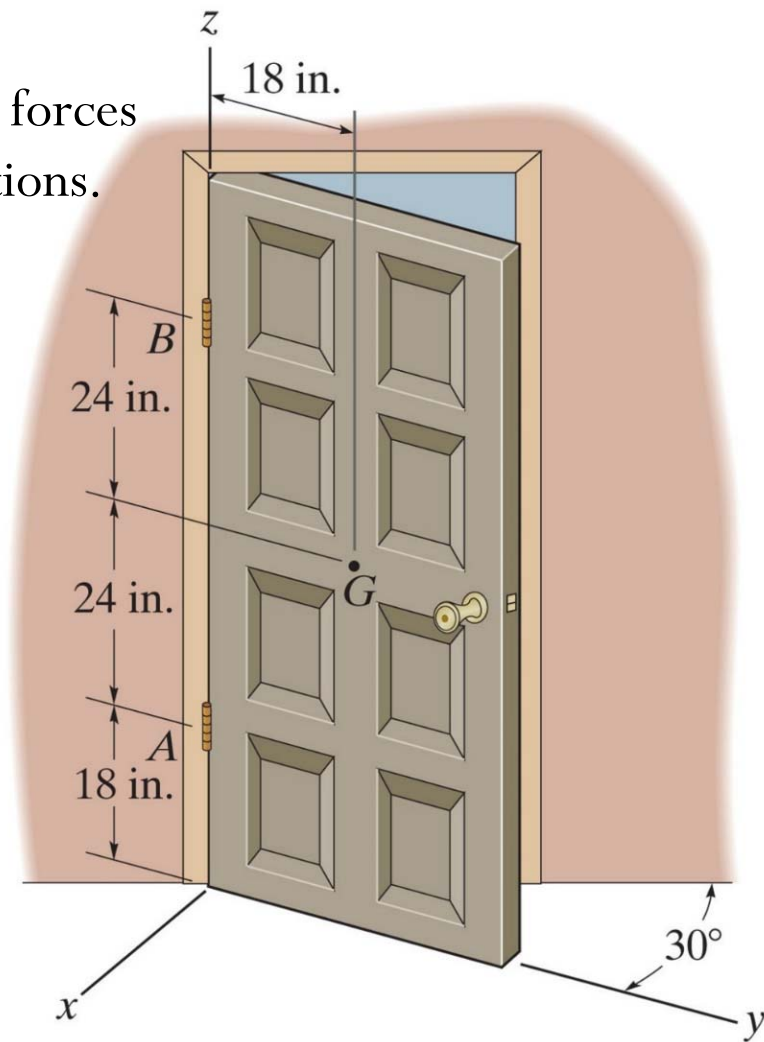
Types of Connection	Reaction	Number of Unknowns
<p>(5)</p>  <p>single journal bearing</p>		
<p>(6)</p>  <p>single journal bearing with square shaft</p>		
<p>(7)</p>  <p>single thrust bearing</p>		

* Couple-moments are not applied to FBD if the body is supported elsewhere by additional bearings, pins or hinges that are **properly aligned** to prevent rotation in one or more axes).

TABLE 5-2 Continued

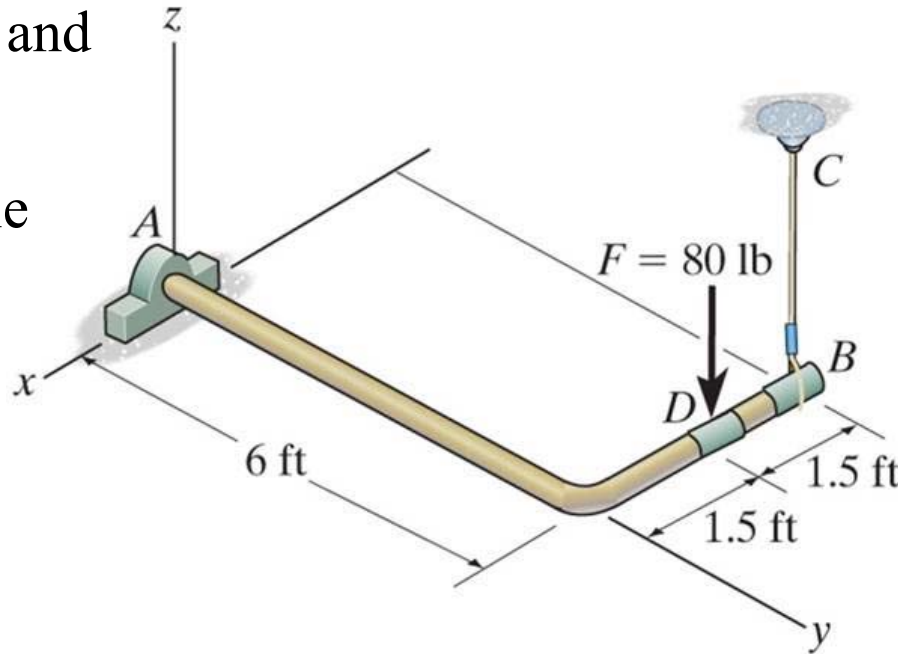
Types of Connection	Reaction	Number of Unknowns
(8)  single smooth pin		
(9)  single hinge		
(10)  fixed support		

The 100 lb door has its center of gravity at G . Determine the components of reaction at hinges A and B if hinge B resists only forces in the x and y directions and A resists forces in the x, y, z directions.

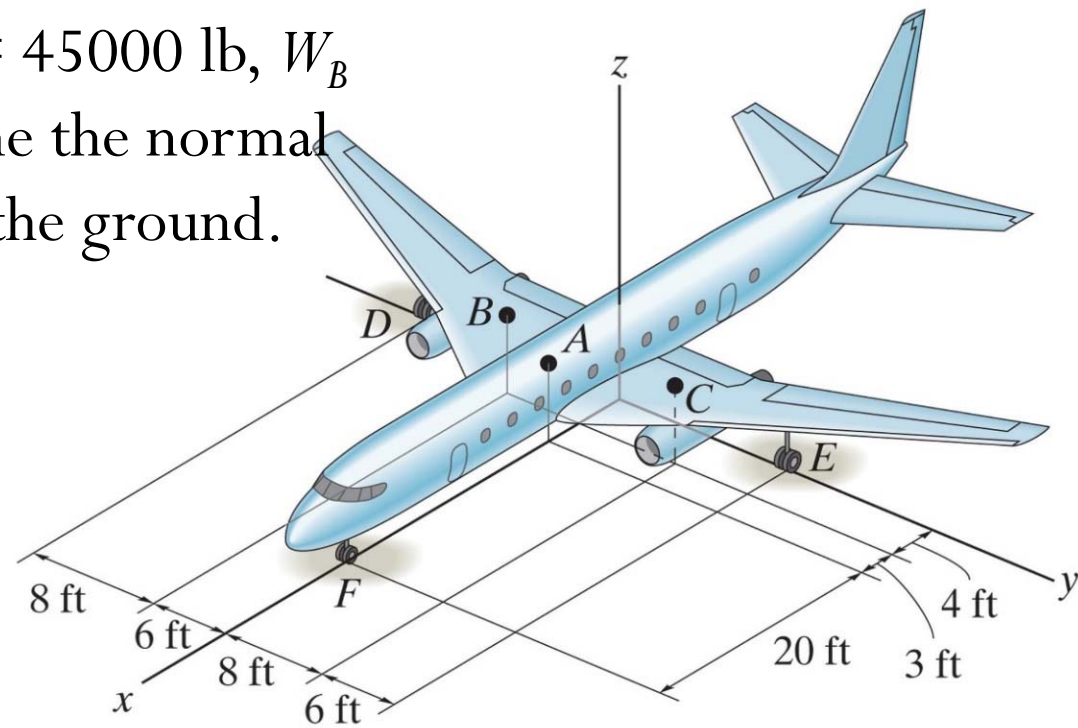


Given: The rod, supported by thrust bearing at A and cable BC, is subjected to an 80 lb force.

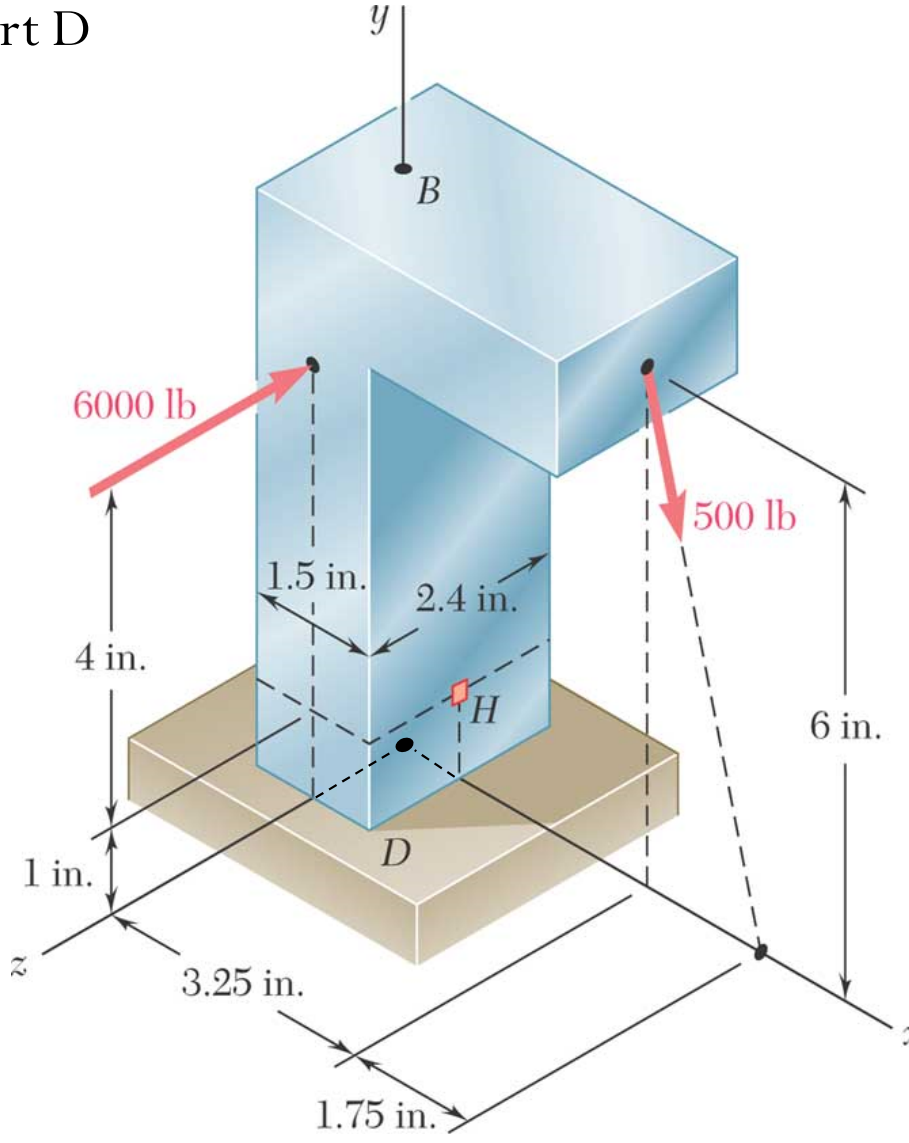
Find: Reactions at the thrust bearing A and cable BC.



If these components have weights $W_A = 45000$ lb, $W_B = 8000$ lb and $W_C = 6000$ lb, determine the normal reactions of the wheels D , E , and F on the ground.

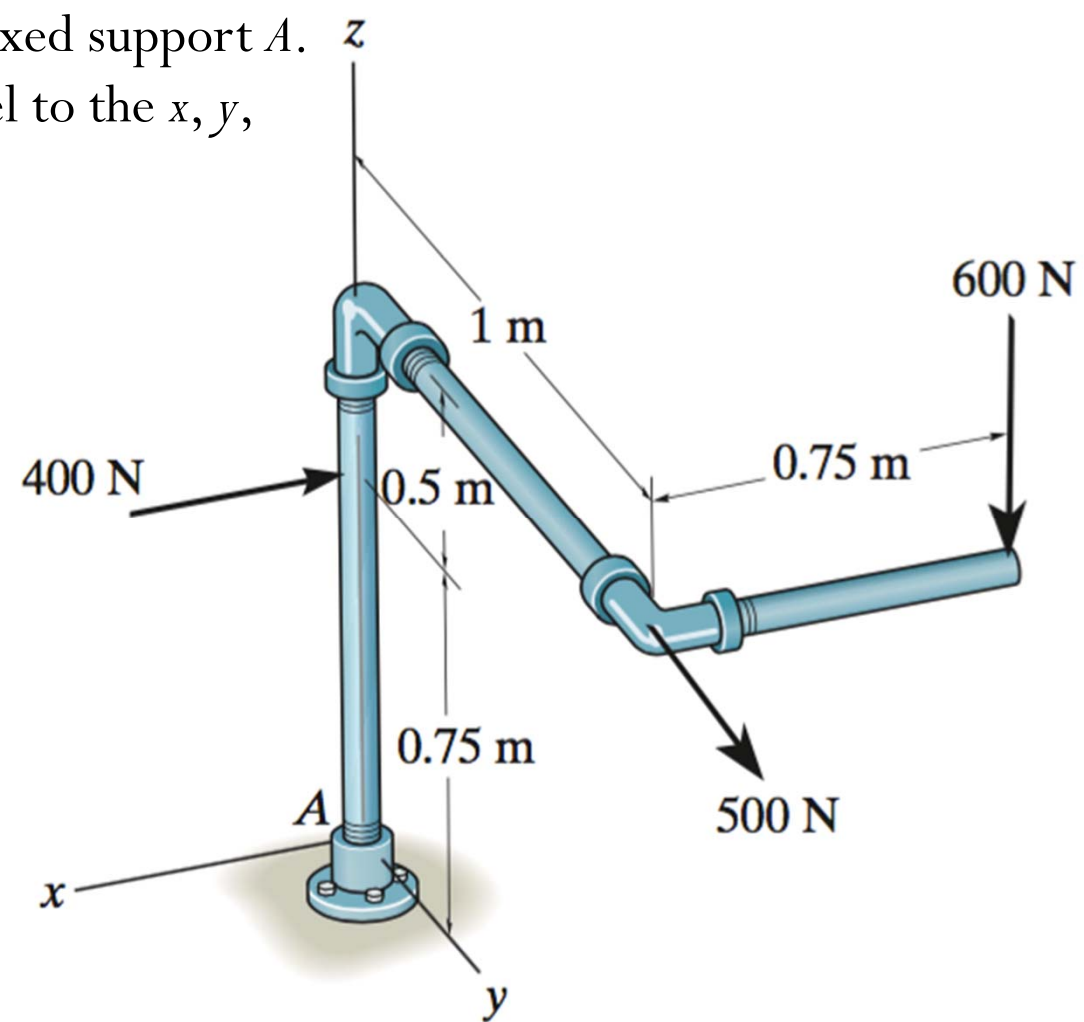


Calculate the reaction forces and moments at the support D at the base of the structure.

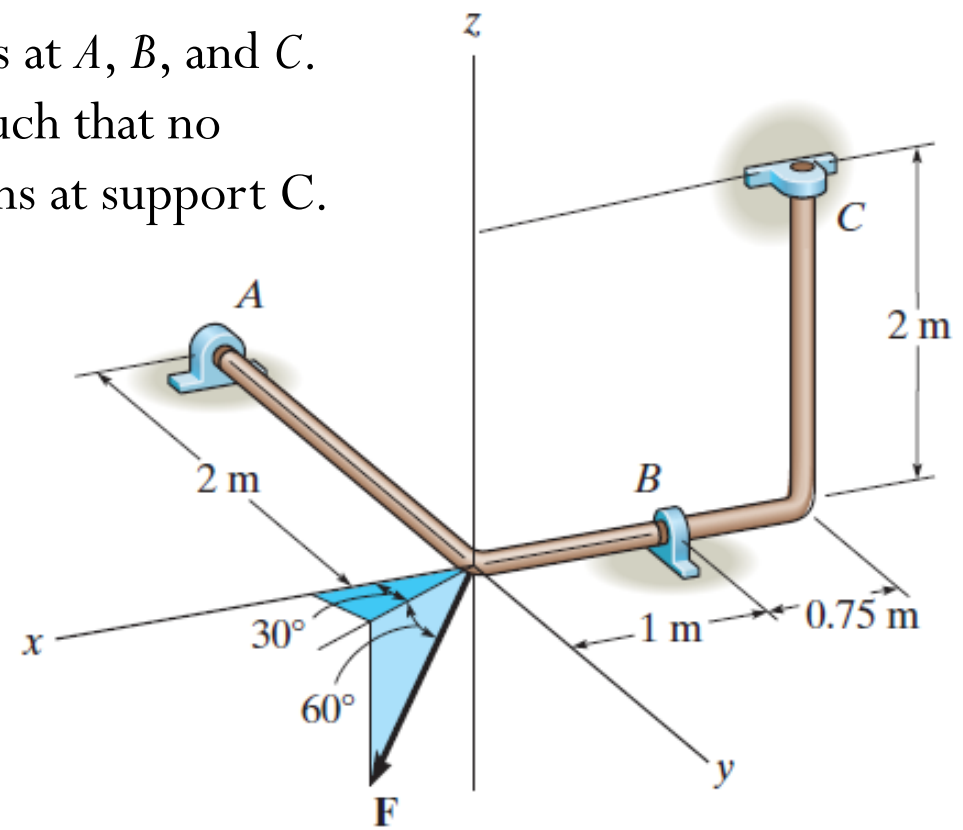


Determine the components of reaction at the fixed support A .

The 400 N, 500 N, and 600 N forces are parallel to the x , y , and z axes, respectively.



A bent rod is supported by smooth journal bearings at A , B , and C . $F = 800$ N. The supports are **properly aligned** such that no moment support is present. Determine the reactions at support C .



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

