Lec14

Thursday, October 22, 2020 9:57 AM

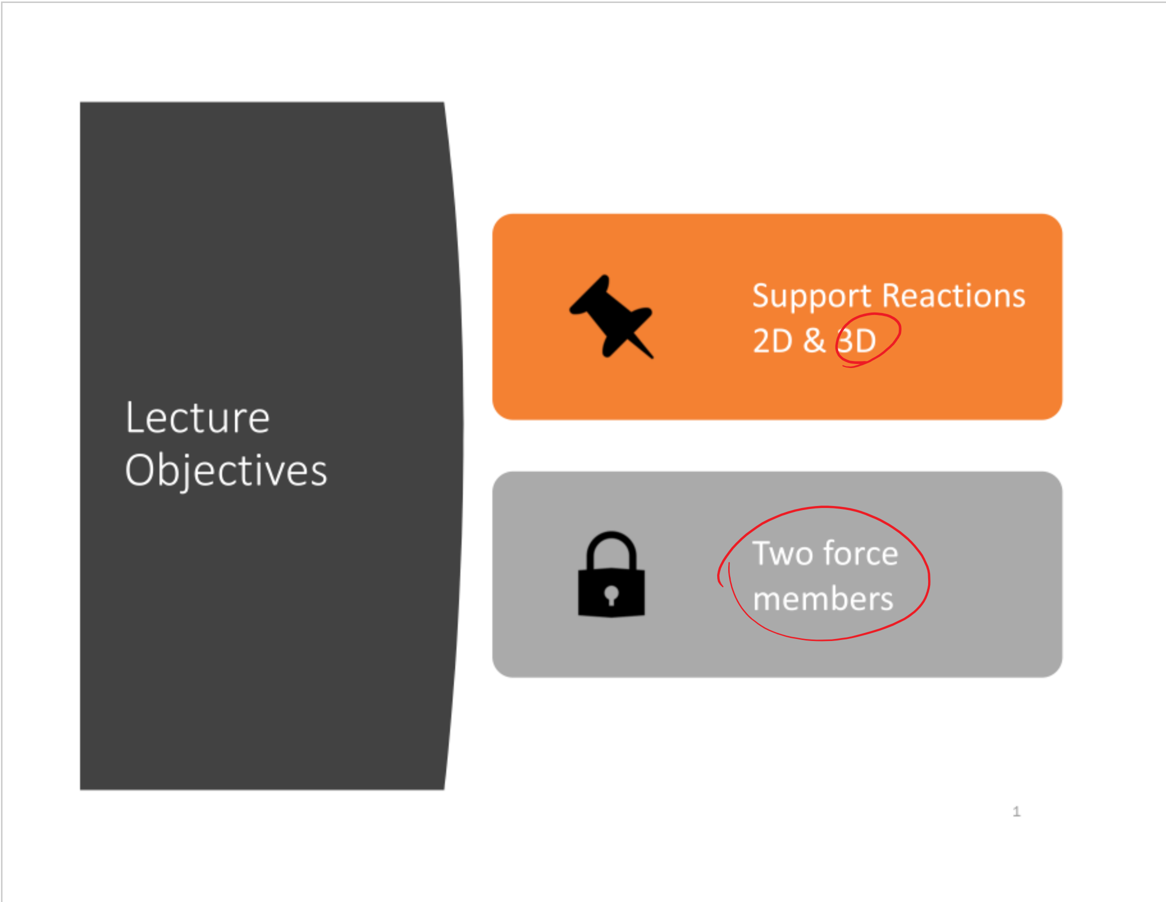
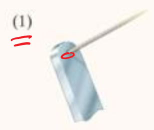
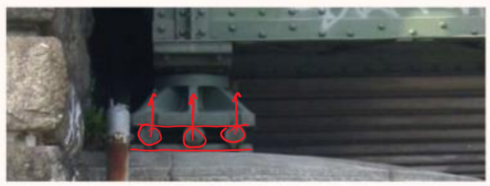
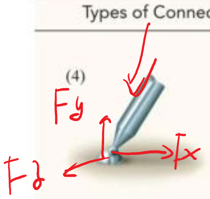


TABLE 5–2 Supports for Rigid Bodies Subjected to Three-Dimensional Force Systems

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

i-Clicker Time

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

Types of Connection	Reaction	Number of Unknowns
(4)  ball and socket		

✓ A) 3 forces

B) 3 forces and 1 moment

C) 3 forces and 2 moments

D) 3 forces and 3 moments

E) None of the above

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

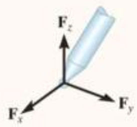
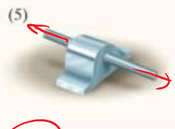
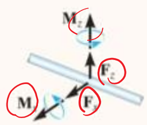
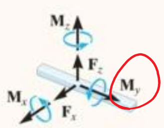
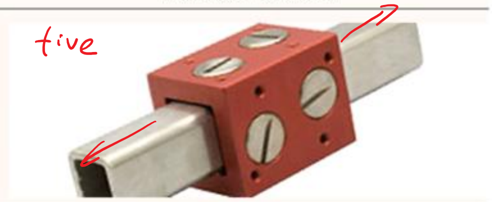
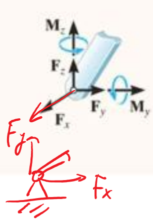
Types of Connection	Reaction	Number of Unknowns
(4)  ball and socket		 three
(5)  single journal bearing		 four

TABLE 5–2 Continued

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

i-Clicker Time

TABLE 5–2 Continued		
Types of Connection	Reaction	Number of Unknowns
(9)  single hinge		

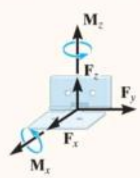
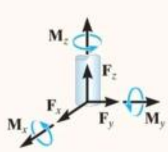
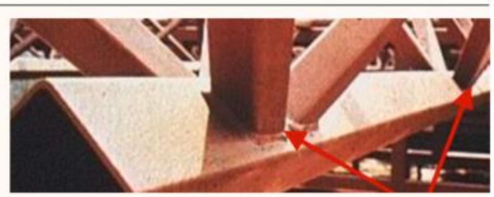
A) 3 forces

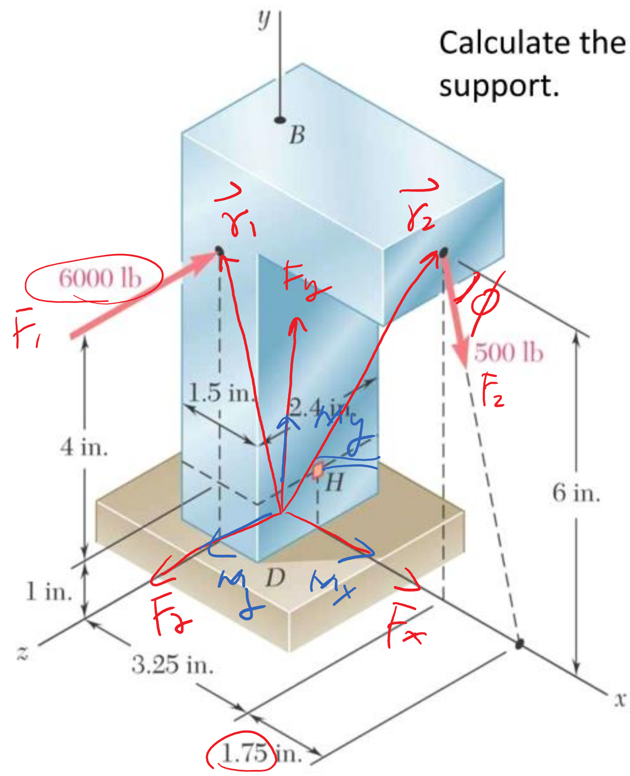
B) 3 forces and 1 moment

C) 3 forces and 2 moments

D) 3 forces and 3 moments

✓E) None of the above

TABLE 5–2 Continued		
Types of Connection	Reaction	Number of Unknowns
(9)  single hinge		five 
(10)  fixed support		 six



Calculate the reaction forces at the support.

$\Sigma F_x = 0 \qquad F_x + 500 \cdot \cos\phi = 0$

$\Sigma F_y = 0 \qquad F_y - 500 \cdot \sin\phi = 0$

$\Sigma F_z = 0 \qquad F_z - 6000 = 0$

$\vec{M} = \vec{r} \times \vec{F}$

$\Sigma \vec{M}_0 = 0$

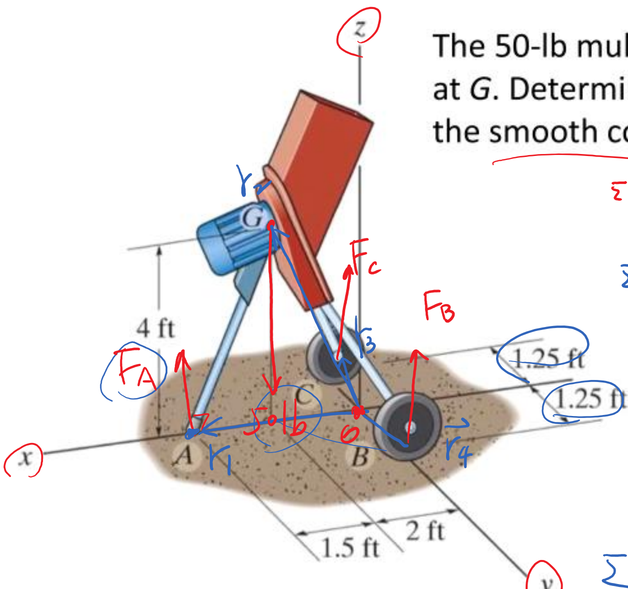
$M_x \hat{i} + M_y \hat{j} + M_z \hat{k} + \vec{r}_1 \times \vec{F}_1 + \vec{r}_2 \times \vec{F}_2 = \vec{0}$

$\vec{r}_1 =$

$\vec{F}_1 =$

$\vec{r}_2 =$

$\vec{F}_2 =$



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

$\Sigma F_z = 0 \qquad F_A + F_B + F_C = 50 \text{ lb}$

$\Sigma \vec{M}_0 = \vec{0} \qquad \vec{r}_1 \times \vec{F}_A + \vec{r}_2 \times \vec{G} + \vec{r}_3 \times \vec{F}_C + \vec{r}_4 \times \vec{F}_B = \vec{0}$

$F_B = F_C$

$\Sigma \vec{M}_A = 0 \qquad 3.5 F_A = 50 \cdot 2$

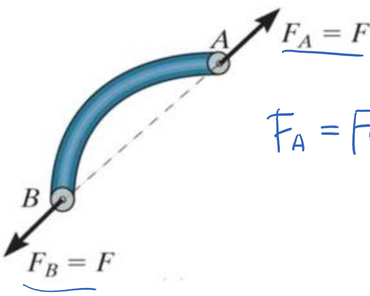
F_A

$\Sigma M_y = 0$

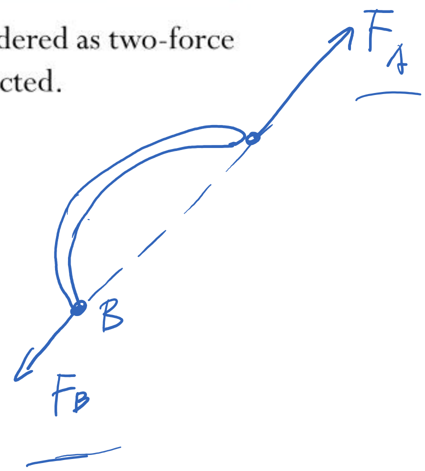
$[(\vec{r}_1 \times \vec{F}_A) \cdot \hat{j}] + [(\vec{r}_2 \times \vec{G}) \cdot \hat{j}] = 0$

Two-force members

In the cases above, members AB can be considered as two-force members, provided that their weight is neglected.



$F_A = F_B$



Find the maximum weight that can be support by cage if the maximum loads that can be applied on arm A and hydraulic BC are given.