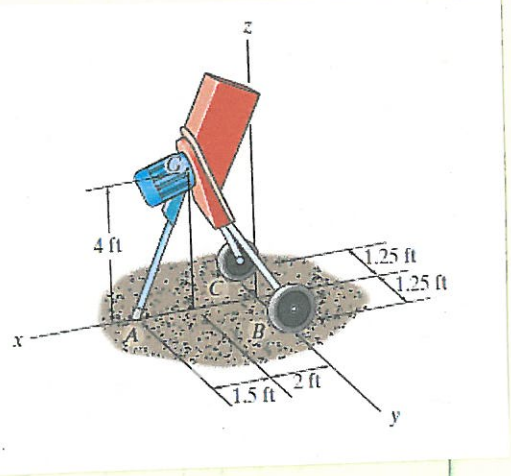
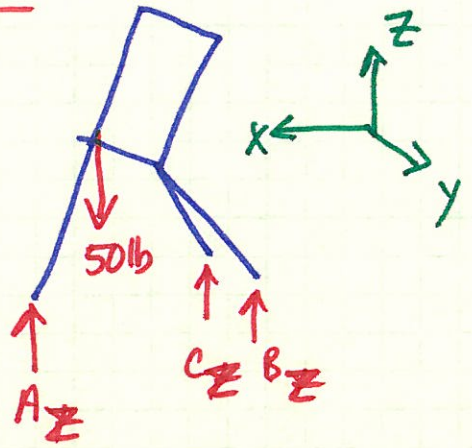
5–65

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



FBD



⇉ See dimensions

ΣM ABOUT ORIGIN

NON CONCURRENT
6 EQNS
3 UNKS

FORCES, MOMENT REACTIONS	$\vec{r}_{F/O}$	$\vec{F}$	$\vec{r} \times \vec{F}$, Couples Moment Reactions
A_z	$[3.5 \quad 0 \quad 0]$	$[0 \quad 0 \quad 1]A_z$	$[0 \quad -3.5A_z \quad 0]$
B_z	$[0 \quad 1.25 \quad 0]$	$[0 \quad 0 \quad 1]B_z$	$[1.25B_z \quad 0 \quad 0]$
C_z	$[0 \quad -1.25 \quad 0]$	$[0 \quad 0 \quad 1]C_z$	$[-1.25C_z \quad 0 \quad 0]$
50 lbs	$[2 \quad 0 \quad 0]$	$[0 \quad 0 \quad -50]$	$[0 \quad 100 \quad 0]$

$\Sigma M_y = 0$

$-3.5A_z + 100 = 0$ $\quad A_z = 28.6 \text{ lb} \uparrow$

$\Sigma M_x = 0$

$1.25B_z - 1.25C_z = 0$ $\quad B_z = C_z$

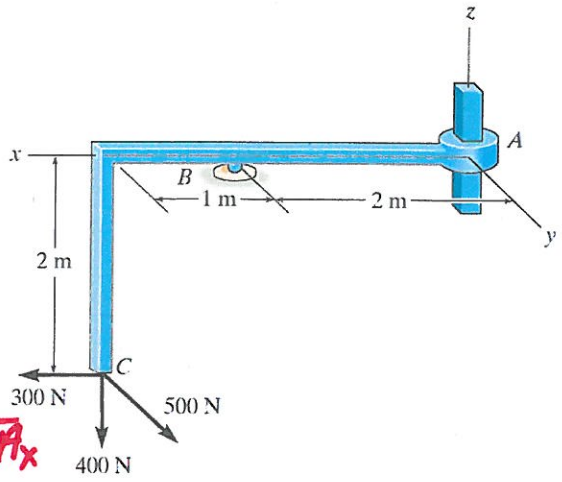
$\Sigma F_z = 0$

$A_z + B_z + C_z - 50 = 0$ $\quad B_z = C_z = 10.7 \text{ lb} \uparrow$

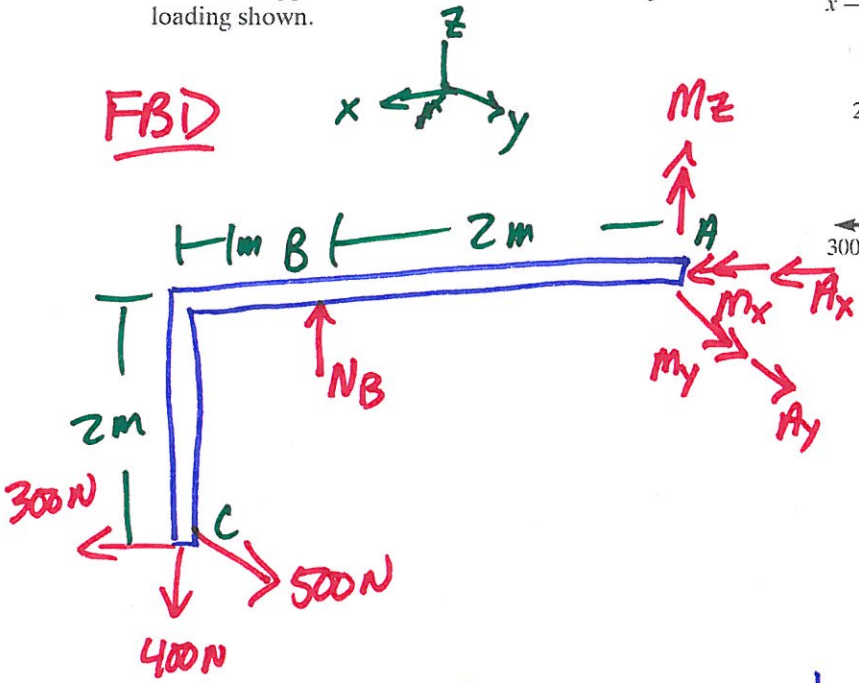
STAEDTLER® No. 937 811E Engineer's Computation Pad

5–77.

The member is supported by a square rod which fits loosely through the smooth square hole of the attached collar at A and by a roller at B. Determine the components of reaction at these supports when the member is subjected to the loading shown.



FBD



NONCONCURRENT
6 EQNS, 6 UNKS ☺

FORCES, MOMENTS REACTIONS	$\vec{r}_{AF}$	$\vec{F}$	$\vec{r}\times\vec{F}$, COUPLES MOMENT REACTIONS
	—	—	$[M_x \; M_y \; M_z]$
$\vec{R}_A$	—	$[A_x \; A_y \; 0]$	—
$\vec{M}_A$	—	$[300 \; 500 \; -400]$	$[1000 \; 600 \; 1500]$
$\vec{C}$	$[3 \; 0 \; -2]$	$[0 \; 0 \; 1]N_B$	$[0 \; -2N_B \; 0]$
$\vec{N}_B$	$[2 \; 0 \; 0]$		

$\Sigma F_x = 0$ $\quad A_x + 300 + 0 = 0 \quad A_x = -300$

$\Sigma F_y = 0$ $\quad A_y + 500 + 0 = 0 \quad A_y = -500$

$\Sigma F_z = 0$ $\quad 0 - 400 + N_B = 0 \quad N_B = 400$

$\Sigma M_x = 0$ $\quad M_x + 1000 + 0 = 0 \quad M_x = -1000$

$\Sigma M_y = 0$ $\quad M_y + 600 - 2N_B = 0 \quad M_y = 200$

$\Sigma M_z = 0$ $\quad M_z + 1500 + 0 = 0 \quad M_z = -1500$

$\vec{R}_A = [-300 \; -500 \; 0]$ N

$\vec{M}_A = [-1000 \; 200 \; -1500]$ N·m

$N_B = 400$ N ↑(z)