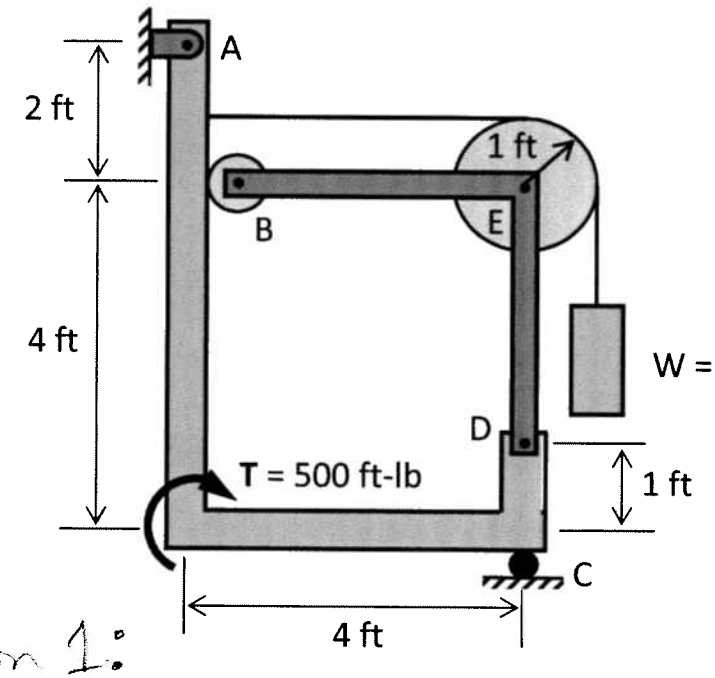
CM Box _____

Problem 1 (35 points)

The two-member frame below supports a 200 lb load (weight) and a 500 ft-lb couple as shown. All components are weightless except for the 200 lb weight. **Set up the following problem, but do not solve. Clearly number your equations and list your unknowns.** We wish to determine

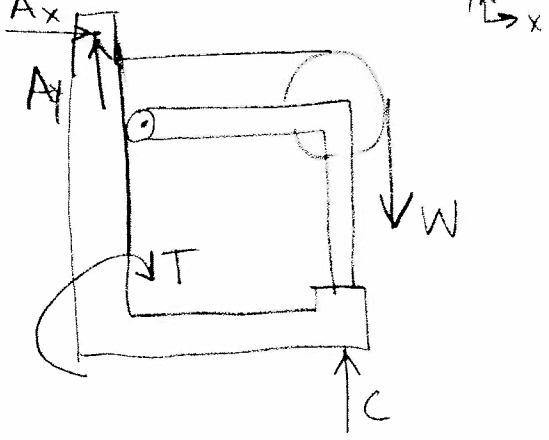
(a) the force that the roller at C exerts on ACD and
(b) the force that the roller at B exerts on ACD.



label equ's: 2 pt
label/list unknowns: 1

Option 1:

FBD 1 (10 pts)



$\Sigma M_A = 0$

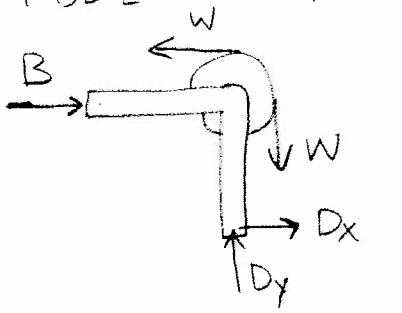
$0 = -T - W(5) + C(4)$

$C = \frac{T + 5W}{4}$ (1)

6 pts (equ)

unknown: C (Ax & Ay)

FBD 2 (10 pts)



$\Sigma M_D = 0$

$0 = -B(3) + W(4) - W(1)$

$B = W$ (2)

6 pts (equ)

unknown: B (Dx & Dy)

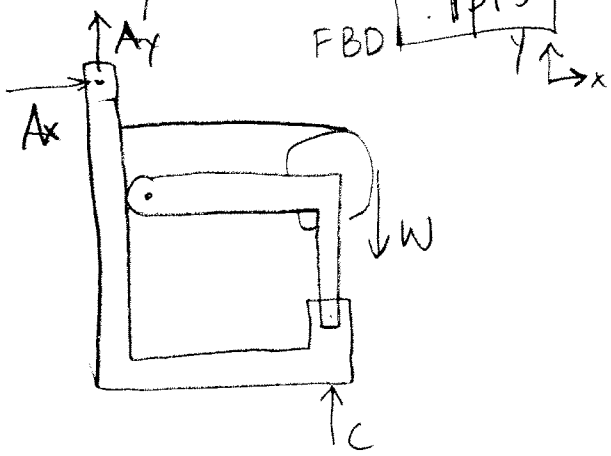
Prob 1

label eqns: 2 pts
list unknowns: 1 pt

CM Box _____

Option 2: 9 pts

FBD



$\Sigma M_A = 0$

$0 = -T - W(5) + C(4)$ ①

$C = \frac{T + 5W}{4}$

5 pts

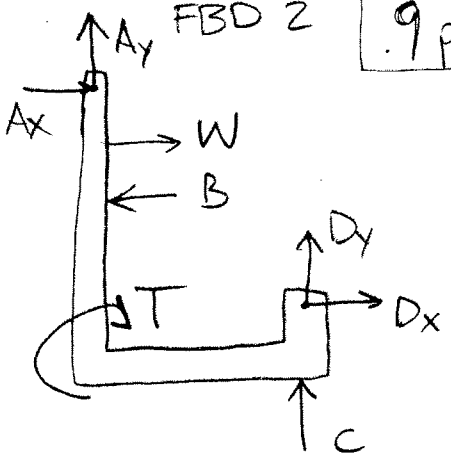
$\Sigma F_x = 0 \rightarrow A_x = 0$ ② 2 pts

$\Sigma F_y = 0 = A_y - W + C$

$A_y = W - C$ ③ 2 pts

unknown: C, A_x & A_y

FBD 2 9 pts



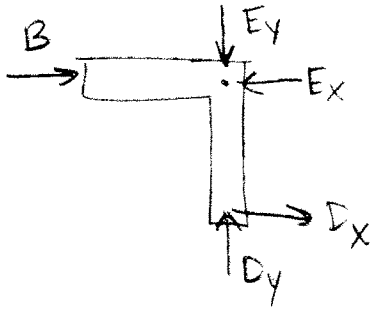
$\Sigma M_D = 0$

$0 = -T + B(3) - W(4) - A_y(4)$ ④ 5 pts

unknown: B, A_x, A_y, C, (D_x & D_y)

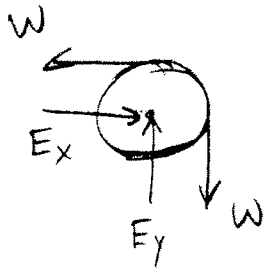
Option 1 variation

FBD 2:



5 pts

FBD 3:



5 pts

$\Sigma M_D = 0$

4 pts

$0 = -B(3) + W(4) - W(1) + E_x(3)$

$\Sigma F_x = 0$ $E_x = 0$

2 pts