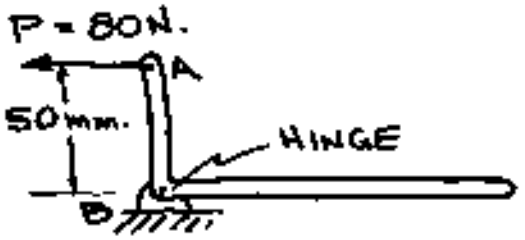
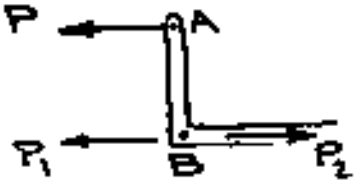
PROB. 3.82 P.116 MECH 234+235



a.) REPLACE P WITH AN EQUIVALENT FORCE - COUPLE AT HINGE, B.

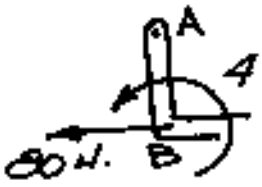


ADD EQUAL & OPP. FORCES P_1 & P_2 AT HINGE B.

$P_1 = P_2 = P = 80N.$

= ↶ FORCE VECTORS P & P_2 CREATE A COUPLE.

$M = (80N.)(50mm.)$
$= 4,000 N mm. = 4 N-m.$



RESULT:
REMAINING FORCE VECTOR
$P_1 = 80N.$ AT B
AND COUPLE, $M = 4,000 N-mm.$

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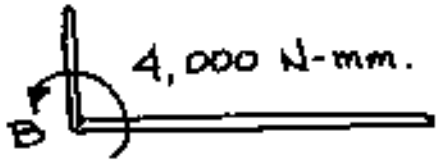
b.) WHAT TWO FORCES AT C AND D ARE EQUIVALENT TO COUPLE AT B?



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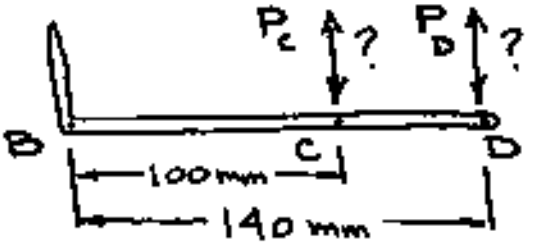
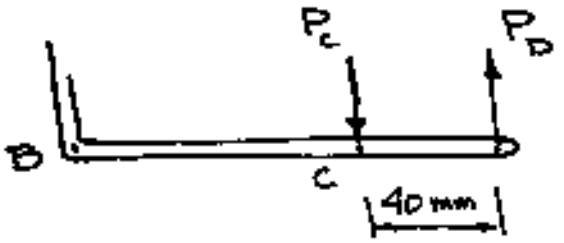


P_C and P_D MUST PRODUCE A MOMENT EQUIVALENT TO 4,000 N-mm CCW ↶

P_C and P_D NEED TO PRODUCE A COUPLE
$\therefore P_C = -P_D$

PROB. 3.82 cont'd.



$\Sigma F = 0 = -P_C + P_D$

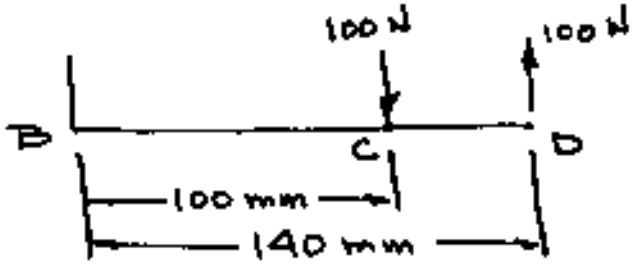
$P_C + P_D$ MUST BE EQUAL + OPP.

$M = 4{,}000 \text{ N mm} \circlearrowleft = P_D (40 \text{ mm}) \circlearrowleft$

$100 \text{ N} = P_D$

$\therefore \boxed{P_D = 100 \text{ N} \downarrow \quad \text{and} \quad P_C = 100 \text{ N} \uparrow}$

CHECK YOUR ANSWER!



CCW +)

THESE FORCES NEED TO PRODUCE A CCW MOMENT AT B = 4,000 N mm.

$\Sigma M_B = -100 \text{ N} (100 \text{ mm}) + 100 \text{ N} (140 \text{ mm})$

$= -10{,}000 + 14{,}000$

$= +4{,}000 \text{ N mm.}$ CCW ✓