wc14lect

Announcements

- Enter your student netID on Mastering Engineering
- In-class Quiz 3 next Monday (10/2)

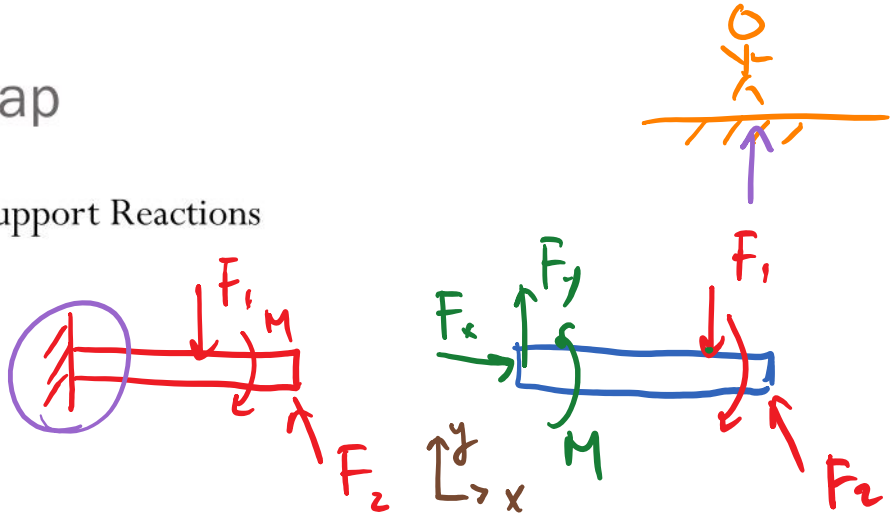
❑ Upcoming deadlines:

- Tuesday (10/3)
  - PL HW10
- Thursday (10/5)
  - ME HW11

1

Recap

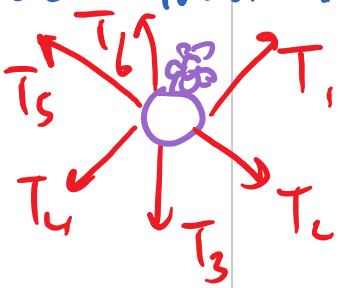
- Support Reactions



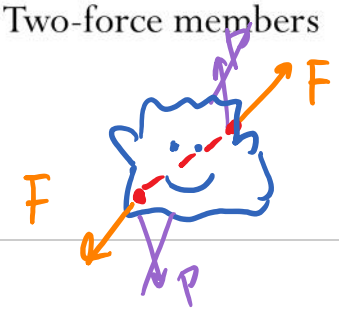
- Constraints (Proper, Redundant, Improper)

Redundant Constraint = more unknowns than E.o.E.

Improper:

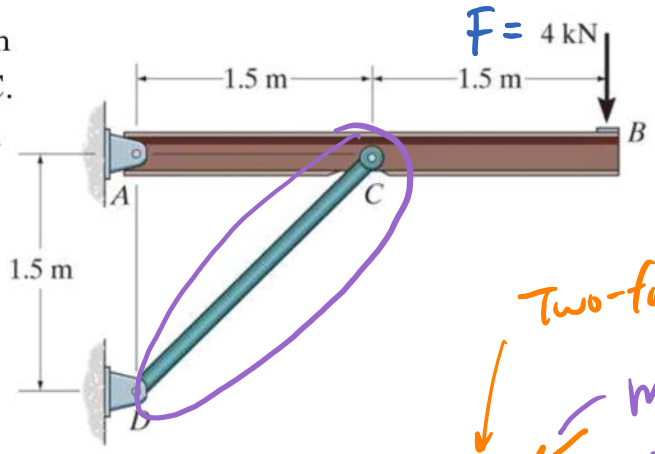


- Two-force members



2

Given the load at B of the beam is supported by pins at A and C. Find the support reactions at A and C.

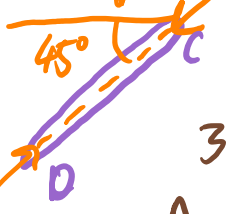


Given: F

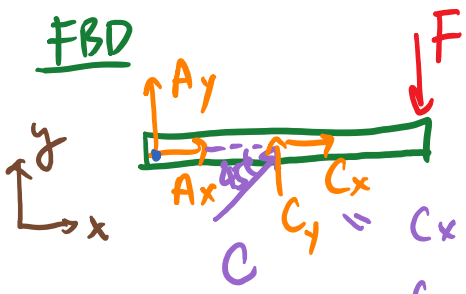
Find: $\vec{A}$, $\vec{C}$

Two-force member

mass is negligible



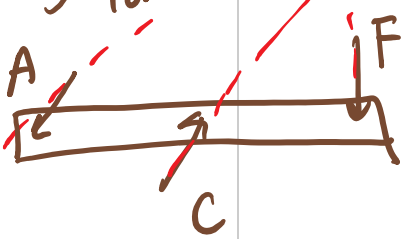
FBD



$C_x = C\cos 45°$

$C_y = C\sin 45°$

3 force member



3

EoE

$\Sigma F_x = 0 = A_x + C_x = A_x + C\cos 45° = 0$

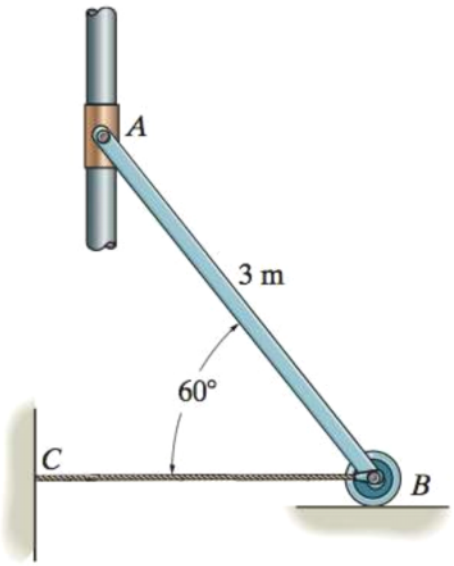
$\Sigma F_y = 0 = A_y + C_y - F = A_x + C\sin 45° - F = 0$

$\Sigma M_A = 0 = C_y(1.5\text{m}) - F(3\text{m}) = 0$

$\Rightarrow \boxed{C_y = \frac{F(3)}{1.5} = 8\text{ kN}}$

$A_y + (8\text{ kN}) - (4\text{ kN}) \Rightarrow \boxed{A_y = -4\text{ kN}}$

The uniform rod AB has a mass of 40 kg. Determine the force in the cable when the rod is in the position shown. There is a smooth collar at A.

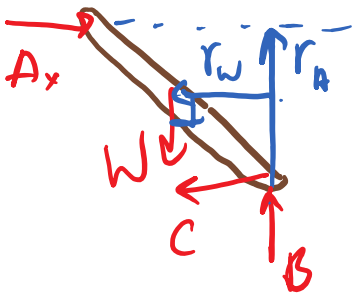


5

Given : m

Find : $\vec{A}$

FBD

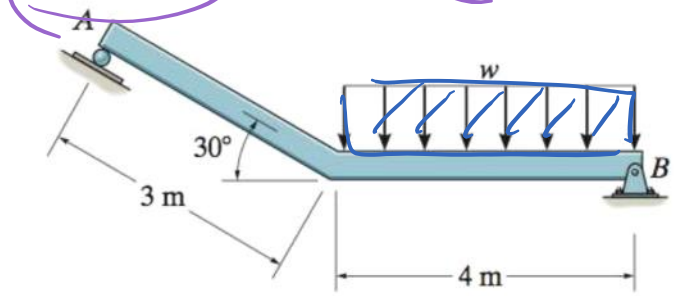


EoE

$$\Sigma M_B = W\left(\frac{3}{2}\cos 60^\circ\right) - A\,(3\sin 60^\circ) = 0$$

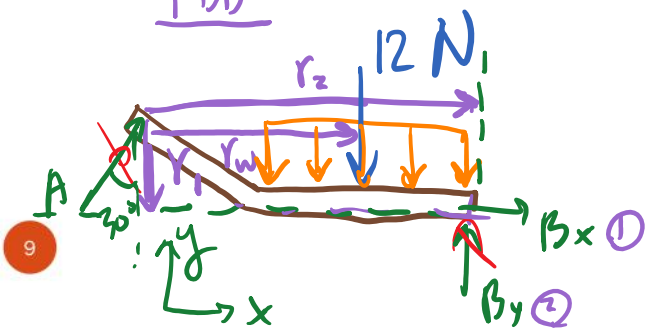
$$A = \frac{W\left(\frac{3}{2}\cos 60^\circ\right)}{(3\sin 60^\circ)} = \frac{mg\left(\frac{3}{2}\cos 60^\circ\right)}{3\sin 60^\circ}$$

Given $w = 3$ N/m, what is the free body diagram for the beam below and reactions at B?



(Neglect mass of the beam)

FBD



EoE

$\Sigma F_y = B_y - 12N + A\cos 30° = 0$

$\Sigma M_A = -12N(r_w) + B_x r_1 + B_y r_2 = 0$

$\Sigma F_x = B_x + A\sin 30° = 0$

$\Rightarrow \boxed{B_x = -1.86\ N}$

$\boxed{B_y = 8.78\ N}$