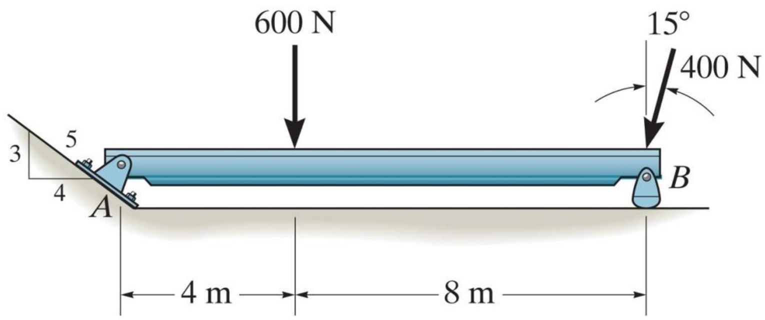
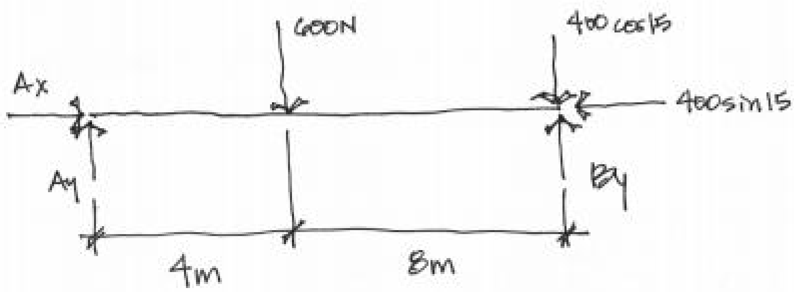


Draw the free body diagram and calculate the external reactions on the beam at A (pin) and B (rocker). Neglect the thickness of the beam.

FBD:



$$+\circlearrowleft \Sigma M_A = 0 = -600(4) - 400\cos 15\,(12) + B_y(12)$$

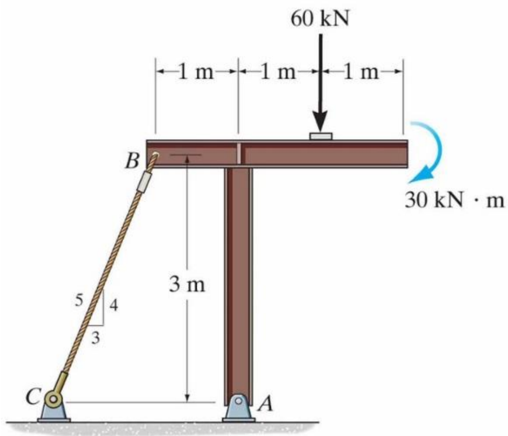
$$\boxed{B_y = 586.37\ \text{N} \uparrow}$$

$$\uparrow \Sigma F_y = 0 = A_y - 600 - 400\cos 15 + 586.37$$

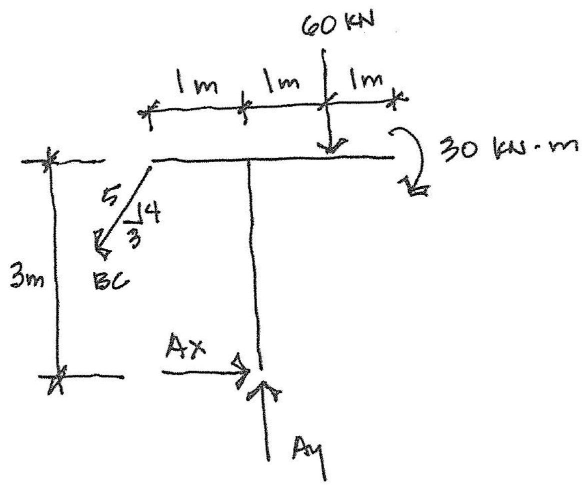
$$\boxed{A_y = 400\ \text{N} \uparrow}$$

$$\rightarrow \Sigma F_x = 0 = A_x - 400\sin 15$$

$$\boxed{A_x = 103.53\ \text{N} \rightarrow}$$



Draw the free-body diagram and calculate the external support reactions at the pin and the tension in cable BC.



$$+\circlearrowleft \Sigma M_A = 0 = \tfrac{3}{5}BC(3) + \tfrac{4}{5}BC(1) - 60(1) - 30$$

$$2.6\,BC = 90$$

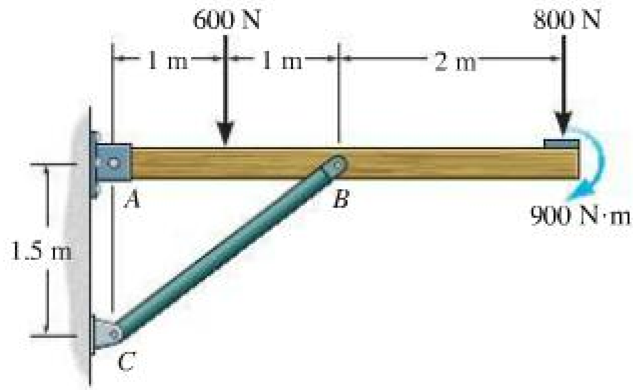
$$\boxed{BC = 34.6 \text{ KN (T)}}$$

$$+\uparrow \Sigma F_y = 0 = A_y - \tfrac{4}{5}(34.6) - 60$$

$$\boxed{A_y = 87.68 \text{ KN} \uparrow}$$

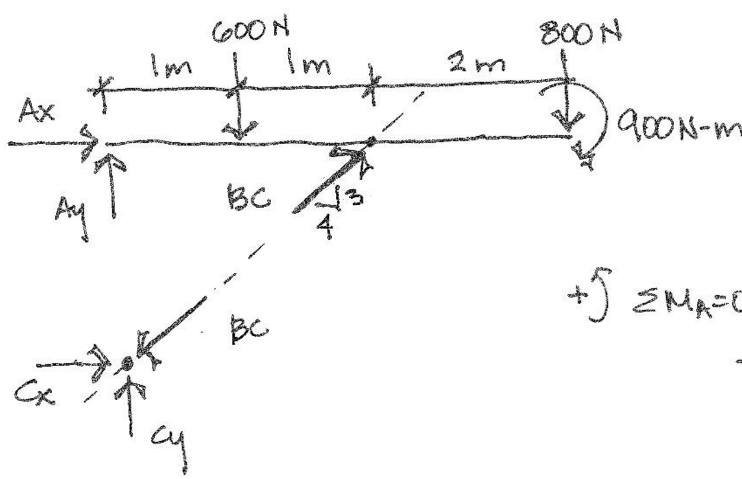
$$\xrightarrow{+} \Sigma F_x = 0 = -\tfrac{3}{5}(34.6) + A_x$$

$$\boxed{A_x = 20.76 \text{ KN} \rightarrow}$$



Draw the free-body diagram and calculate the external support reactions at the pin at A and the pin at B utilizing any 2-force members.

FBD:



* BC IS A 2- FORCE MEMBER

$+\circlearrowleft \sum M_A = 0 = -600(1) - 800(4) + \frac{3}{5}BC(2) - 900$

$BC = 3916.7 \text{ N (C)}$

$+\uparrow \sum F_y = 0 = A_y - 600 - 800 + \frac{3}{5}(3917)$

$A_y = -950.2$

$\boxed{A_y = 950.2 \text{ N} \downarrow}$

$\xrightarrow{+} \sum F_x = 0 = A_x + \frac{4}{5}(3917)$

$A_x = -3133.6$

$\boxed{A_x = 3133.6 \text{ N} \leftarrow}$

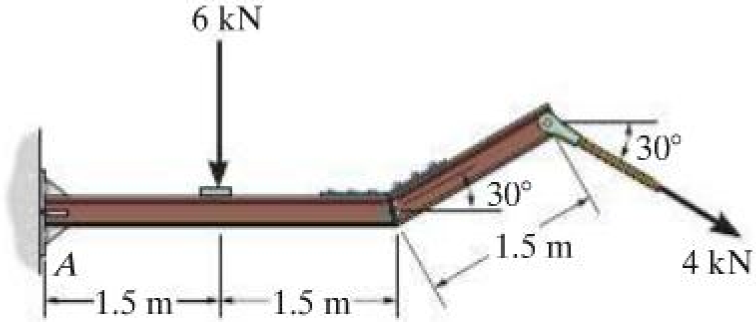
@ POINT C:

$\xrightarrow{+} \sum F_x = 0 = C_x - \frac{4}{5}(3917)$

$\boxed{C_x = 3133.6 \text{ N} \rightarrow}$

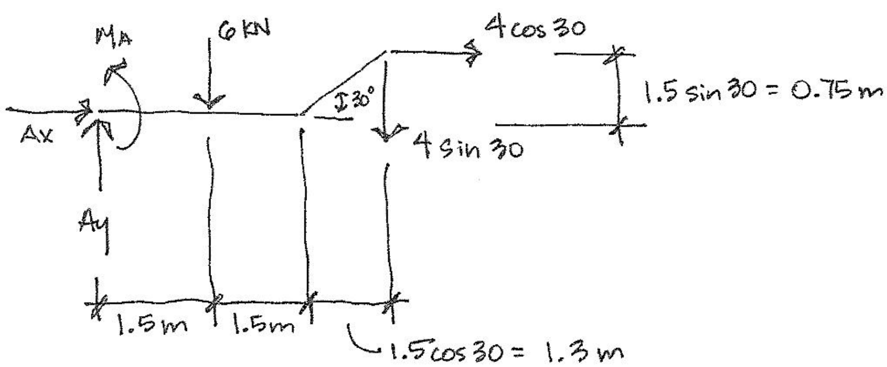
$+\uparrow \sum F_y = 0 = C_y - \frac{3}{5}(3917)$

$\boxed{C_y = 2350.2 \text{ N} \uparrow}$



Determine the components of reaction at the fixed support at A. Indicate direction in your answer with arrows.

FBD:



$\xrightarrow{+} \Sigma F_x = 0 = A_x + 4\cos 30$

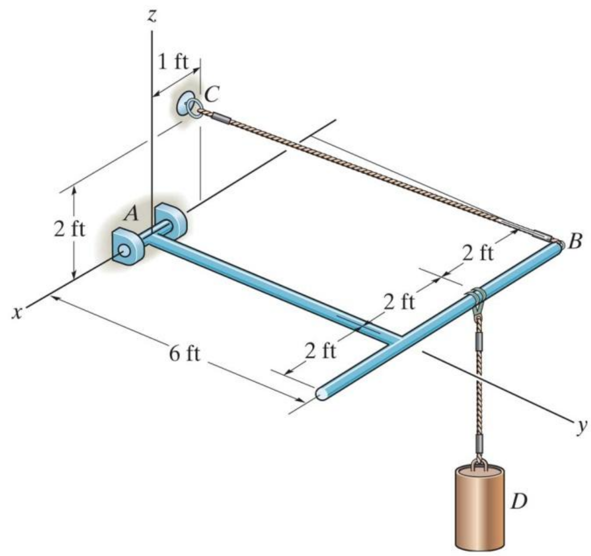
$A_x = -3.46$ $\boxed{A_x = 3.46 \text{ KN} \leftarrow}$

$+\uparrow \Sigma F_y = 0 = A_y - 6 - 4\sin 30$

$A_y = 8$ $\boxed{A_y = 8 \text{ KN} \uparrow}$

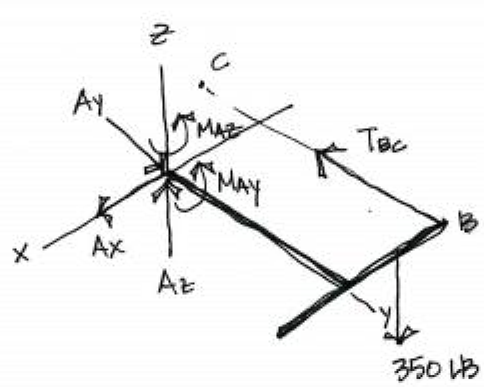
$+\circlearrowleft \Sigma M_A = 0 = M_A - 6(1.5) - 4\sin 30(4.3) - 4\cos 30(0.75)$

$\boxed{M_A = 20.2 \text{ KN-m} \circlearrowleft}$



The member is supported by a pin at A and cable BC. If the weight of the cylinder is 350 lb, determine the external support reactions at A and the force in cable BC. Draw the free-body diagram and assume right hand rule positive sign convention.

FBD:



COORDINATES:

$B(-4, 6, 0)$

$C(-1, 0, 2)$

$\bar{r}_{BC} = 3i - 6j + 2k$

$|r_{BC}| = \sqrt{3^2 + (-6)^2 + (2)^2} = 7$

$\bar{u}_{BC} = \frac{3}{7}i - \frac{6}{7}j + \frac{2}{7}k$

EQUATIONS:

① $\Sigma F_x = 0 = A_x + \frac{3}{7}T_{BC}$

② $\Sigma F_y = 0 = A_y - \frac{6}{7}T_{BC}$

③ $\Sigma F_z = 0 = A_z + \frac{2}{7}T_{BC} - 350$

④ $\Sigma M_x = 0 = -350(6) + \frac{2}{7}T_{BC}(6)$

$\boxed{T_{BC} = 1225 \text{ LB}}$

⑤ $\Sigma M_y = 0 = M_{Ay} - 350(2) + \frac{2}{7}(1225)(4)$

$\boxed{M_{Ay} = -700 \text{ LB-FT}}$

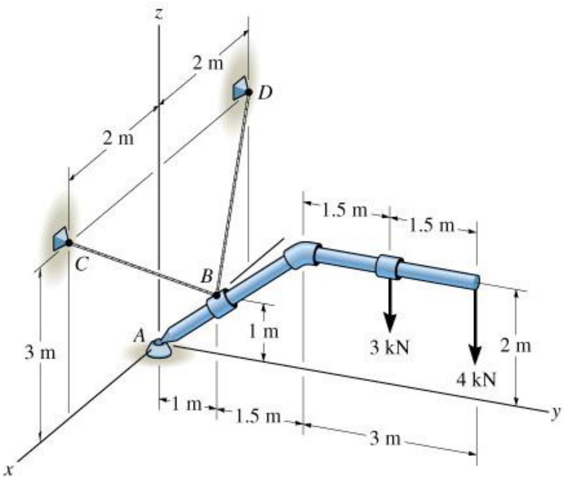
⑥ $\Sigma M_z = 0 = M_{Az} - \frac{3}{7}(1225)(6) + \frac{6}{7}(1225)(4)$

$\boxed{M_{Az} = -1050 \text{ LB-FT}}$

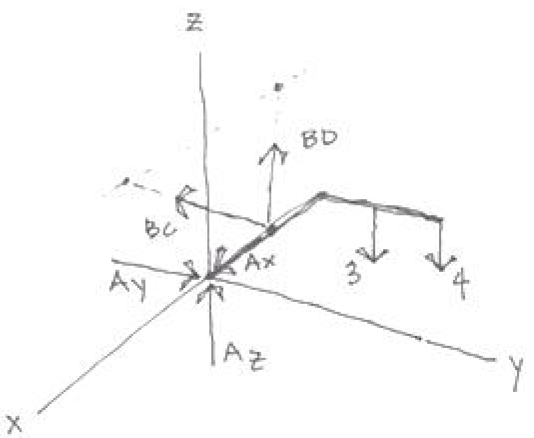
SOLVING ①, ②, & ③ W/ $T_{BC} = 1225$ LB:

$\boxed{A_x = -525 \text{ LB}}$ $\boxed{A_y = 1050 \text{ LB}}$

$\boxed{A_z = 0}$



Draw the free-body diagram and calculate the tension in cables BC and BD and the external reactions at the ball and socket at A. Assume right hand rule sign convention as positive.



COORDINATES:

A(0, 0, 0)

B(0, 1, 1)

C (2, 0, 3)

D (-2, 0, 3)

UNIT VECTORS FOR CABLES:

$\bar{r}_{BD} = \{-2\hat{i} - 1\hat{j} + 2\hat{k}\}$

$\bar{r}_{BC} = \{2\hat{i} - 1\hat{j} + 2\hat{k}\}$

$\bar{u}_{BD} = \{-\frac{2}{3}\hat{i} - \frac{1}{3}\hat{j} + \frac{2}{3}\hat{k}\}$

$\bar{u}_{BC} = \{\frac{2}{3}\hat{i} - \frac{1}{3}\hat{j} + \frac{2}{3}\hat{k}\}$

EQUILIBRIUM:

(1) $\Sigma F_x = 0 = A_x - \frac{2}{3}BD + \frac{2}{3}BC$

(2) $\Sigma F_y = 0 = A_y - \frac{1}{3}BD - \frac{1}{3}BC$

(3) $\Sigma F_z = 0 = A_z + \frac{2}{3}BD + \frac{2}{3}BC - 3 - 4$

(4) $\Sigma M_x = 0 = \frac{1}{3}BD(1) + \frac{1}{3}BC(1) + \frac{2}{3}BD(1) + \frac{2}{3}BC(1) - 3(4) - 4(5.5)$

$0 = -34 + BD + BC$

(5) $\Sigma M_y = 0 = -\frac{2}{3}BD(1) + \frac{2}{3}BC(1)$

$BD = BC$

(6) $\Sigma M_z = 0 = \frac{2}{3}BD(1) - \frac{2}{3}BC(1)$

$BD = BC$

SOLVING:

PLUG (5) OR (6) INTO (4):

$34 = BD + BD$

$\boxed{\begin{array}{l} BD = 17 \text{ KN} \\ BC = 17 \text{ KN} \end{array}}$

FROM (1):

$Ax = \frac{2}{3}(17) - \frac{2}{3}(17)$ $\boxed{Ax = 0}$

FROM (2):

$Ay = \frac{1}{3}(17) + \frac{1}{3}(17)$ $\boxed{Ay = 11.33 \text{ KN}}$

FROM (3):

$Az = -\frac{2}{3}(17) - \frac{2}{3}(17) + 3 + 4$

$\boxed{Az = -15.67 \text{ KN}}$