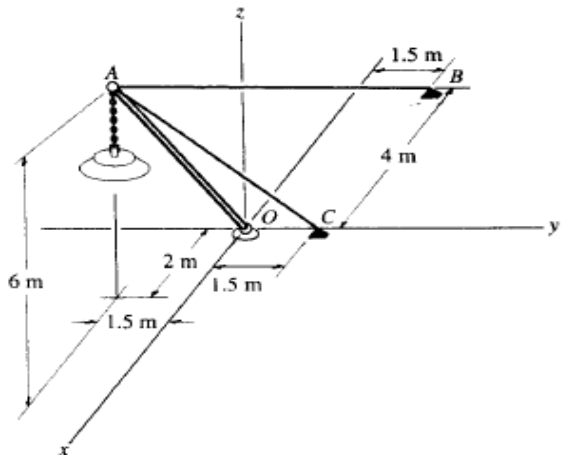
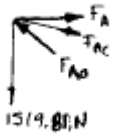
La lámpara de una masa de 1.5Kg es apoyado por un poste AO y el cable AB y CA. Si l fuerza en el poste actúa a lo largo de su eje. Determine las fuerzas en el AO, el AB y la CA para el equilibrio.





$$Fac = Fao\left\{\frac{2}{6.5}i, -\frac{1.5}{6.5}j, +\frac{6}{6.5}k\right\}N$$

$$Fab = Fab\left\{-\frac{6}{9}i, +\frac{3}{9}j, -\frac{6}{9}k\right\}N$$

$$Fac = Fac\left\{-\frac{2}{7}i, +\frac{3}{7}j - \frac{6}{9}k\right\}N$$

$$w = 1.5(9.81)k\ m\ (-147.15k)N$$

$$\Sigma Fx = 0;\ 0.3077Fao - 0.6667Fab - 0.2857Fac = 0$$

$$\Sigma Fy = 0;\ -0.2308Fao + 0.3333Fab + 0.4286Fac = 0$$

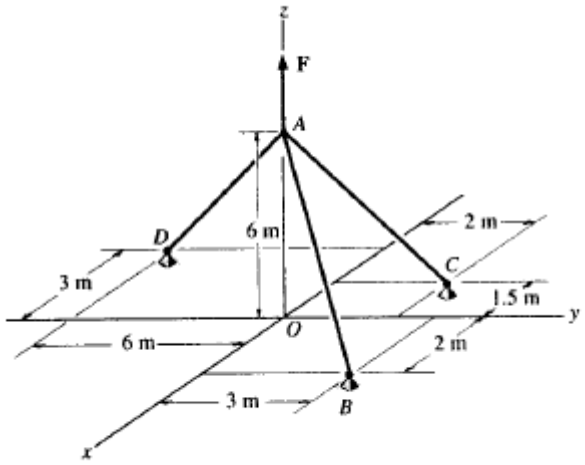
$$\Sigma Fz = 0;\quad o.9231Fao - 0.667Fab - 0.8571Fac - 147.15 = 0$$

$$Fao = 319\ N$$

$$Fab = 110\ N$$

$$Fac = 85.8\ N$$

si el cable AB está sometido a una tensión de $T = 700\ N$, determinar la tensión en los cables AC y AD y la magnitud de la vertical fuerza F.



$Notacion\ del\ vector\ cartesiano.$

$$F_{AB} = 700\left(\frac{2i\ + 3j - 6k}{\sqrt{2^2 + 3^2 + (-6)^2}}\right)$$

$$F_{AB} = [200i + 300j - 600k]N$$

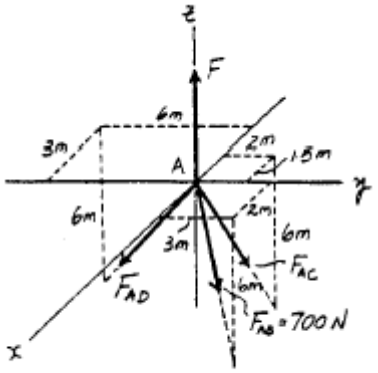
$$F_{AC} = F_{AC}\left(\frac{-1.5i\ + 2j - 6k}{\sqrt{(-1.5)^2 + 2^2 + (-6)^2}}\right)$$

$$F_{AC} = -0.2308F_{AC}i + 0.3077F_{AC}j - 0.9231F_{AC}k$$

$$F_{AD} = F_{AD}\left(\frac{-3i - 6j - 6k}{\sqrt{(-3)^2 + (-6)^2 + (-6)^2}}\right)$$

$$F_{AD} = -0.3333F_{AD}i - 0.6667F_{AD}j - 0.6667F_{AD}k$$

$$F = Fk$$



Ecuacion de Equilibrio

$\sum F = o;$

$F_{AB} + F_{AC} + F_{AD} + F = 0$

$(200 - 0.2308F_{AC} - 0.3333F_{AD})i + (300 + 0.3077F_{AC} - 0.6667F_{AD})j + (-600 - 0.9231F_{AC} - 0.6667F_{AD} + F = 0$

Componentes de la ecuacion i, j, k *para tener*:

$200 - 0.2308F_{AC} - 0.3333F_{AD}=0 \quad (1)$

$300 + 0.3077F_{AC} - 0.6667F_{AD} + F = 0 \quad (2)$

$-600 - 0.9231F_{AC} - 0.6667F_{AD} + F = 0 \quad (3)$

Introducir ecuacion 1 *y* 2 *en la ecuacion* 3.

$F_{AC} = 130\ N$

$F_{AD} = 510\ N$

$F = 1060\ N = 1.06kN$

DETERMINE LA FUERZA QUE ACTUA A LO LARGO DEL EJE DE CADA UNO DE LOS TRES PAVONEOS QUE NECESITO APOYAR LOS 500 – KG DE BLOQUE.

$$FB = FB \frac{3J + 2.5K}{3.905} = 0.7682\ FB\ j + 6402\ FB\ K$$

$$FC = FC \left(\frac{0.75I - 5J - 2.5K}{5.640} \right) = 0.1330FC\ I - 088865FC\ J - 0.4432FC\ K$$

$$FD = FD \left(\frac{-1.25I - 5J - 2.5K}{5.728} \right) = -02182\ FC\ I - 0.8729FDJ - 04364FD\ K$$

$W = -500(9.81)\ K = -4905K$

$\sum F = 0$; $FB + FC + FD + W = 0$

$\sum Fx = O$; $0.1330FC - 02182\ FC = 0$

$\sum Fy = O$; $07682FB - 08865FC - 08729\ FD = 0$

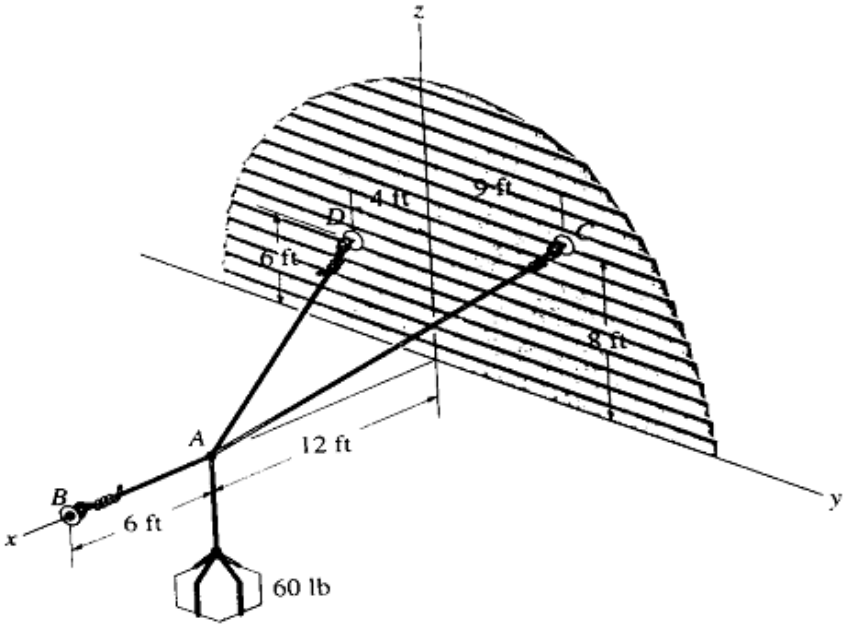
$\sum Fz = O$; $0.6402\ FB - 0.4432\ FC - 0.4364\ FD - 4905K = 0$

FB = 19.2 KN RESPUESTA

FC = 10.40 KN RESPUESTA

FD = 6.32 KN RESPUESTA

3.52. Determinar la tensión en el cable AB, AC y AD, necesaria para guardar la caja de 60 libras en equilibrio.



$$\mathbf{W} = -60\mathbf{k}$$

$$\mathbf{T}_B = T_B\mathbf{i}$$

$$\mathbf{T}_C = T_C\left(-\frac{12}{17}\mathbf{i} + \frac{9}{17}\mathbf{j} + \frac{8}{17}\mathbf{k}\right)$$

$$= -0.706T_C\mathbf{i} + 0.529T_C\mathbf{j} + 0.471T_C\mathbf{k}$$

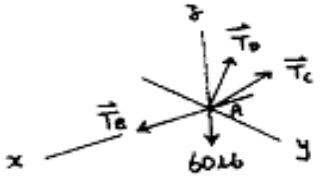
$$\mathbf{T}_D = T_D\left(-\frac{12}{14}\mathbf{i} - \frac{4}{14}\mathbf{j} + \frac{6}{14}\mathbf{k}\right)$$

$$= -0.857T_D\mathbf{i} - 0.286T_D\mathbf{j} + 0.429T_D\mathbf{k}$$

$$\Sigma F_x = 0; \quad T_B - 0.706T_C - 0.857T_D = 0$$

$$\Sigma F_y = 0; \quad 0.529T_C - 0.286T_D = 0$$

$$\Sigma F_z = 0; \quad -60 + 0.471T_C + 0.429T_D = 0$$



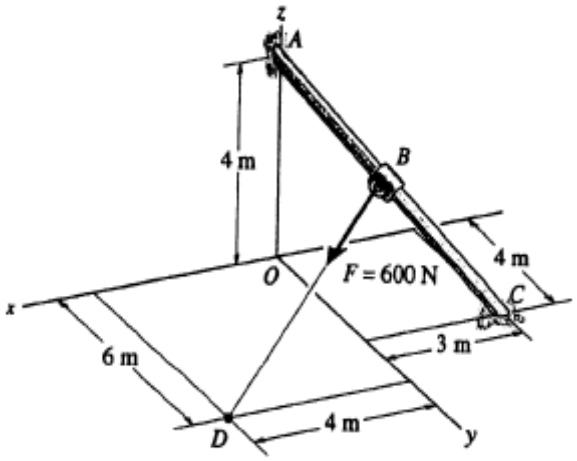
Problemas.

$T_B = 109$ lb **Ans**

$T_C = 47.4$ lb **Ans**

$T_D = 87.9$ lb **Ans**

Determine los componentes de F que actúa a lo largo de la vara CA y perpendicular a él. El punto B se localiza al punto medio de la vara.



$r_{AC} = (-3i + 4j - 4k),\ r_{AC} = \sqrt{(-3)^2 + 4^2 + (-4)^2} = \sqrt{41}\, m$

$$r_{AB} = \frac{r_{AC}}{2} = \frac{-3i + 4j - 4k}{2} = -1.5i + 2j - 2k$$

$r_{AD} = r_{AB} + r_{BD}$
$r_{BD} = r_{AD} + r_{AB}$
$= (4i + 6j - 4k) - (-1.5i + 2j - 2k)$
$= (5.5i + 4j - 2k)m$

$r_{BD} = \sqrt{(5.5)^2 + (4)^2 + (-2)^2} = 7.0887m$

$$F = 600\left(\frac{r_{BD}}{r_{BD}}\right) = 465.528i + 338.5659j - 169.2829k$$

Componente de F a lo largo de r_{AC} es $F_{\parallel}$

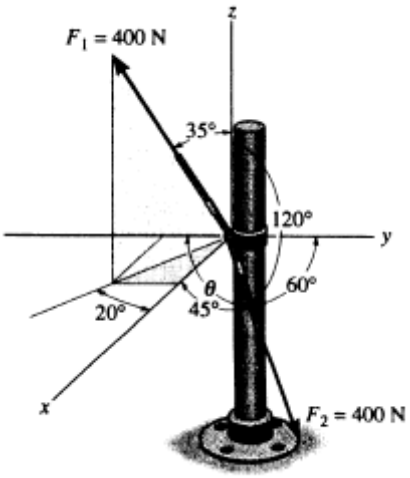
$$F_{\parallel} = \frac{F.r_{AC}}{r_{AC}} = \frac{(465.528i + 338.5659j - 169.2829k)(-3i + 4j - 4k)}{\sqrt{41}}$$

$F_{\parallel} = 99.1408 = 99.1$

Componente de F perpendicular a r_{AC} es $F_{\perp}$

$F_{\perp}{}^2 + F_{\parallel}{}^2 = F^2 = 600^2$
$F_{\perp}{}^2 = 600^2 - 99.1408^2$
$F_{\perp} = 591.75 = 592\ N$

Determine el ángulo θ entre los dos cables atados al poste.



Vector unidad:

$u_{F_1} = \sin 35 \circ \cos 20 \circ i - \sin 35 \circ \sin 20 \circ j + \cos 35 \circ k$

$= 0.5390i - 0.1962j + 0.8192k$

$u_{F_2} = \cos 45 \circ i + \cos 60 \circ j + \cos 120 \circ \mathrm{k}$

$= 0.7071i + 0.5j - 0.5k$

Los ángulos entre dos vectores θ: debe determinarse primero el producto punto de dos vectores de unidad.

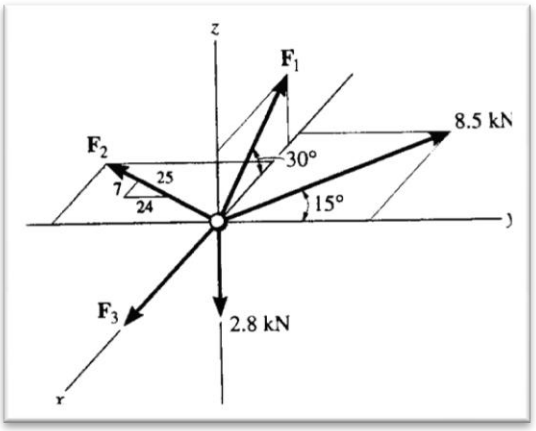
$u_{F_1}.u_{F_2} = (0.5390i - 0.1962j + 0.8192k)(0.7071i + 0.5j - 0.5k)$

$u_{F_1}.u_{F_2} = -0.1265$

Entonces,

$$\theta = \cos^{-1}(u_{F_1}.u_{F_2}) = \cos^{-1}(-0.1265) = 97.3 \circ$$

Determine las magnitudes de f_1, f_2 and f_3 para el equilibrio de la particula.



$$\Sigma F_Z = 0\,; \quad F_1\, Sen\, 30^\circ - 2.8 = 0$$

$$F_1 = 5.60KN$$

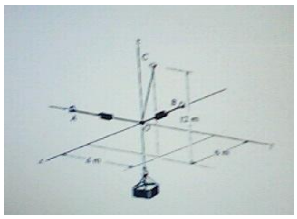
$$\Sigma F_y = 0\,; \quad 8.5\, Cos\, 15^\circ - \left(\frac{24}{25}\right) F_2 = 0$$

$$F_2 = 8.55KN$$

$$\Sigma F_X = 0\,; \; F_3 - 5.6\, Cos\, 30^\circ - 8.55\left(\frac{7}{25}\right) - 8.5\, Sen\, 15^\circ = 0$$

$$F_3 = 9.44\, K$$

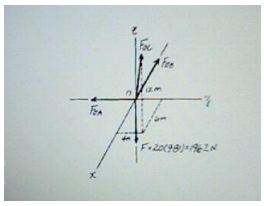
Determine el alargamiento en cada uno de los dos resortes requeridos para sujetar una caja de 20kg mostrada en la posición de equilibrio, cada resorte tiene un alargamiento con una longitud de 2m y una resistencia de k = 300 N/m.



$$F_{OC} = F_{OC}\left(\frac{6i + 4j + 12k}{\sqrt{6^2 + 4^2 + 12^2}}\right) = \frac{3}{7}F_{OC}i + \frac{2}{7}F_{OC}j + \frac{6}{7}F_{OC}K$$

$$F_{OA} = -F_{OA}j \qquad F_{OB} = -F_{OB}k$$

$$F = \{-196.2\, K\}N$$



$$\sum F = 0; \qquad F_{OC} + F_{OA} + F_{OB} = 0$$

$$\left(\frac{3}{7}F_{OC} - F_{OB}\right)i + \left(\frac{2}{7}F_{0C} - F_{OA}\right)j + \left(\frac{6}{7}F_{OC} - 196.2\right)k = 0$$

$$\frac{3}{7}F_{OC} - F_{OB} = 0$$

$$\frac{2}{7}F_{OC} - F_{OA} = 0$$

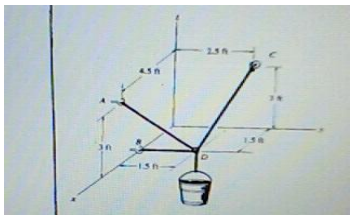
$$\frac{6}{7}F_{OC} - 196.2 = 0$$

$$F_{OC} = 298.9\ N \qquad F_{OB} = 98.1\ N \qquad F_{OA} = 65.4\ N$$

$$S_{OB} = \frac{98.1}{300} = 0.327m = 327mm$$

$$= \frac{64.5}{300} = 0.218m = 218mm$$

La cubeta y el peso total contenido de 20 lb, determine la fuerza en el soporte de los cables DB y DC.



$$U_{DC} = \left\{-\frac{1.5}{3.5}i + \frac{1}{3.5}j + \frac{3}{3.5}k\right\}$$

$$\sum F_X = 0; \quad \frac{3}{4.5}F_{DA} - \frac{1.5}{3.5}F_{DC} = 0$$

$$\sum F_Y = 0; \quad -\frac{1.5}{4.5}F_{DA} - F_{DB} + \frac{1}{3.5}F_{DC} = 0$$

$$\sum F_Z = 0; \quad \frac{3}{4.5}F_{DA} + \frac{3}{3.5}F_{DC} - 20 = 0$$

$F_{DA} = 10.0\ lb$

$F_{DB} = 1.11\ lb$

$F_{DC} = 15.6\ lb$