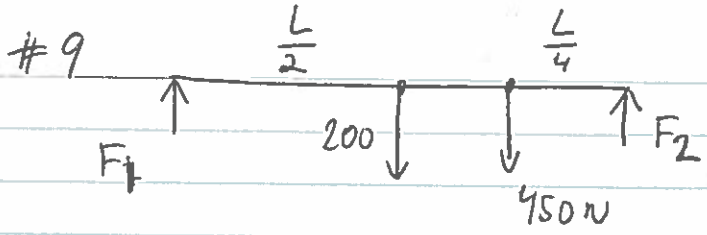
#9




pivot at $F_2$

$\vec{\tau}_2 = 0$

$\vec{\tau}_B = (200)\frac{L}{2}$

$= 100L$ N·m [CCW]

$\vec{\tau}_W = (450)\,L/4$

$= 112.5L$ N·m [CCW]

$\vec{\tau}_1 = -F_1 L$

$\Sigma\vec{\tau} = 0 = \vec{\tau}_1 + \vec{\tau}_2 + \vec{\tau}_B + \vec{\tau}_W$

$0 = F_1 L + 0 + 100L + 112.5L$

$-212.5L = -F_1 L$

$\boxed{F_1 = 213\ N}$

pivot at $F_1$

$\vec{\tau}_1 = 0$

$\vec{\tau}_B = 100L$ [CW]

$\vec{\tau}_W = (450)\left(\frac{3L}{4}\right)$

$= 337.5L$ [CW]

$\vec{\tau}_2 = F_2 L$ [CCW]

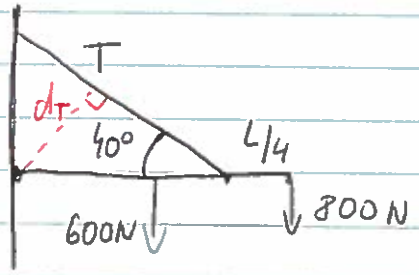
$\Sigma\vec{\tau} = 0 = \vec{\tau}_1 + \vec{\tau}_2 + \vec{\tau}_B + \vec{\tau}_W$

$= 0 + F_2 L - 100 - 337.5$

$F_2 L = 437.5L$

$\boxed{F_2\ 438\ N}$

#10




$\vec{\tau}_B = (600)\left(\frac{L}{2}\right) = 300L$ N·m [CW]

$\vec{\tau}_W = 800L$ N·m [CW]

$\vec{\tau}_T = T(\sin 40°)\frac{3L}{4}$

$= T\ 0.482L$ [CCW]

$\Sigma\vec{\tau} = 0$

$0 = \vec{\tau}_B + \vec{\tau}_W + \vec{\tau}_T$

$= -300L - 800L + 0.482LT$

$\frac{1100L}{0.482L} = T$

$\boxed{T = 2.28 \times 10^3\ N}$

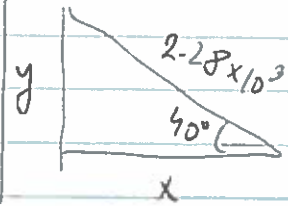
Horizontal:

- the hinge has to cancel out the horizontal component of tension

$T = 2.28 \times 10^3$ N

$X = 2.28 \times 10^3 (\cos 40°)$

$= 1.7 \times 10^3$ N



#10 Vertical forces the hinge deals with:

$\rightarrow T_y, -F_{gB}, -F_{gw}$

Hinge: $F_y = T_y - F_{gB} - F_{gw}$

$= (2.28 \times 10^3)(\sin 40^\circ) - 600 - 800$

$= -66\ N$

$\boxed{\vec{F}_y = -66\ N}$

Write it in vector notation:

$\vec{F}_H = [\,1.7 \times 10^3, -66\,]\ N$

$\vec{F}_{gB} = [\,0, -600\,]\ N$

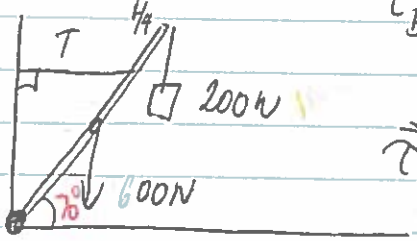
$\vec{F}_{gw} = [\,0, -800\,]\ N$

$\vec{T} = [\,1.7 \times 10^3, 1.47 \times 10^3\,]\ N$

$\Sigma \vec{F} = 0$ for static equilib.

$\Sigma \vec{\tau} = 0$ as well

#11




$\vec{\tau}_B = 600(\cos 70°)(L/2)$
$= 103L$ N·m [CW]

$\vec{\tau}_m = 200(\cos 70°)L$
$= 68.4L$ N·m [CW]

$\vec{\tau}_T = T(\sin 70°)\frac{3L}{4}$
$= 0.705TL$ N·m [CCW]

$\Sigma\vec{\tau} = 0 = \vec{\tau}_B + \vec{\tau}_m + \vec{\tau}_T$
$= -103L - 68.4L + 0.705TL$

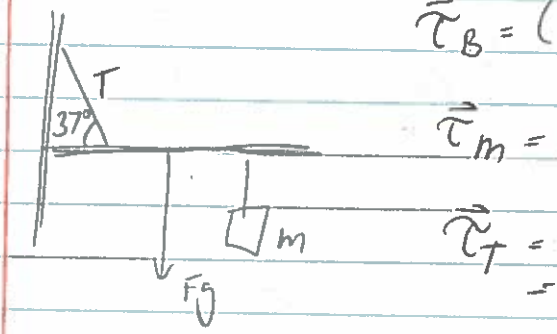
$T = \frac{171.4}{0.705}$

$F_x = T$
$= 243$ N

**243N**

$F_y = 600 + 200 = 800$N

#12



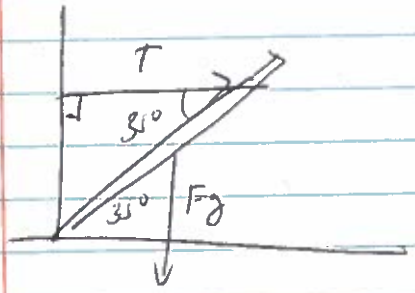

$\vec{\tau}_B = (75)(9.8)(3) = 2205$ [CW]

$\vec{\tau}_m = m(98)(3.5) = 34.3m$ N·m [CW]

$\vec{\tau}_T = (2.4\times10^3)(\sin 37°)(2.0)$
$= 2888.7$ N·m [CCW]

$\Sigma\vec{\tau} = 0 = \vec{\tau}_B + \vec{\tau}_m + \vec{\tau}_T$
$0 = -2205 - 34.3m + 2888.7$
$m = \frac{683.7}{34.3}$
$= 19.9 = 20.0$ kg

#13




$\vec{\tau}_B = mgd$

$= m(9.8)(0.9)(\cos 35°)$

$= 7.22m$ N·m [CW]

$\vec{\tau}_T = 13(\sin 35°)(1.39)$

$= 10.36$ N·m [CCW]

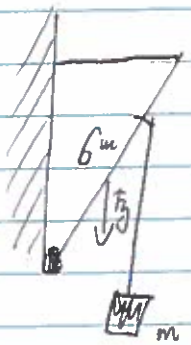
$\Sigma\vec{\tau} = 0 = \vec{\tau}_B + \vec{\tau}_T$

$= -7.22m + 10.36$

$m = \frac{10.36}{7.22}$

$= 1.436$ kg

#14




or use 37°

$\vec{\tau}_B = mg(\cos 53°)(4.0)$

$= 589.8$ N·m [CW]

$\vec{\tau}_m = (45)(9.8)(\cos 53°)(6.0)$

$= 1592.4$ N·m [CW]

$\vec{\tau}_T = T(\cos 37°)(8.0)$

$= 6.39T$

$\Sigma\vec{\tau} = 0 = \vec{\tau}_B + \vec{\tau}_m + \vec{\tau}_T$

$= -589.8 + 1592.4 = 6.39T$

$T = \frac{2182.2}{6.39}$

$T = 341$ N