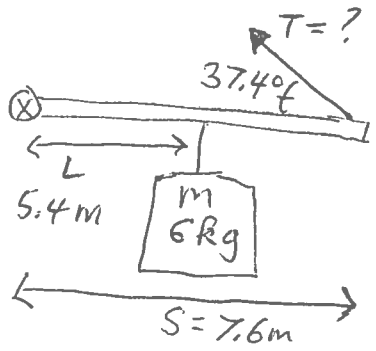
pe
09 torquer - version A

①



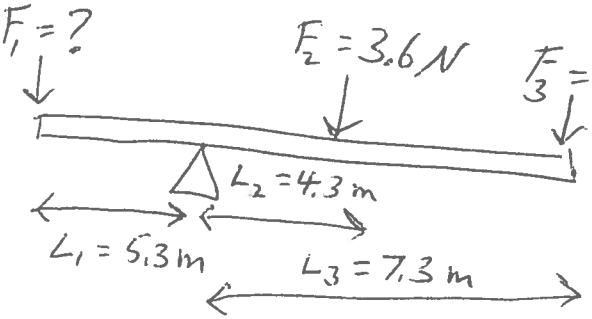
Use $\Sigma\tau = 0$ and $\tau = rF\sin\theta$

$mgL = STsin\theta$

$(5.4)(9.8)(6) = (7.6)(T)\sin 37.4°$

$T = \dfrac{5.4(9.8)(6)}{(7.6)\sin 37.4°} = \boxed{68.8\,N = T}$

②

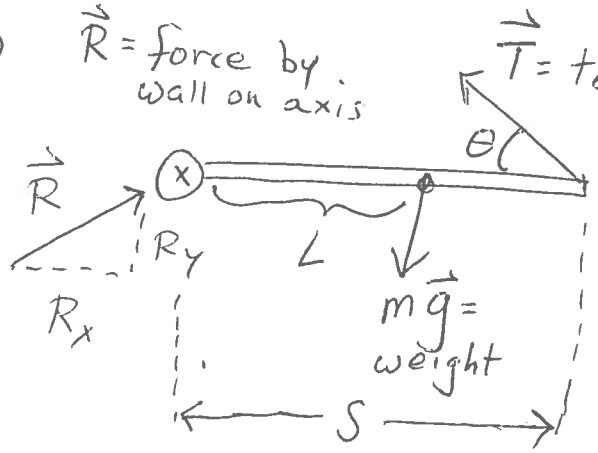


$F_1L_1 = F_2L_2 + F_3L_3$

$F_1 = \dfrac{F_2L_2 + F_3L_3}{L_1}$

$F_1 = \dfrac{3.6(4.3) + 5.1(7.3)}{5.3} = \boxed{9.95\,N = F_1}$

③



Three Governing Eqns:

$STsin\theta = mgL$ ($\Sigma\tau = 0$)

$T\cos\theta = R_x$

$R_y = mg - T\sin\theta$ } $\Sigma\vec{F} = 0$

How to get signs right:

a) An upward (positive) R_y must cancel the downward value of mg.

b) mg and $T\sin\theta$ go in opposite directions.

Another correct and proper way to get the signs right is to say:

$$0 = R_y + F_{T_y} + W_y$$

In our case:

$$mgL = T\,S\sin\theta \quad \Big\} T = ?$$
$$T\cos\theta = R_x \quad \Big\} R_x = ?$$

$$R_x = \frac{mgL}{S\sin\theta}\cdot\cos\theta$$

Want R_x → use $T = \dfrac{mgL}{S\sin\theta}$

$$= \frac{9.2(9.8)(5.7)}{8.1\tan\theta} = \boxed{118\,N = R_x}$$

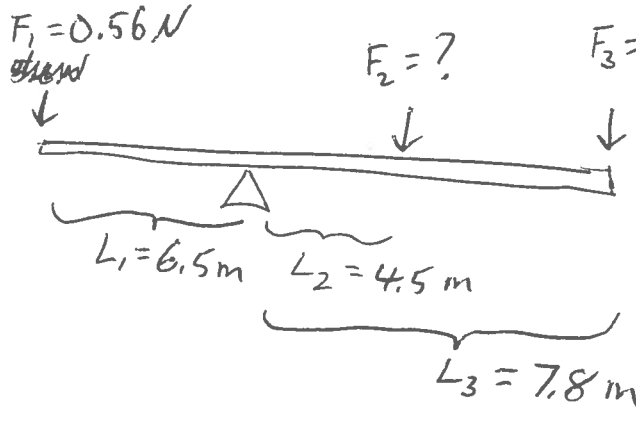
$\uparrow y$, $\rightarrow x$

$F_{T_y} = +T\sin\theta$ (tension in $\hat{y}$ direction)

$W_y = -mg$ (weight)

Given:
$S = 8.1$
$\theta = 28.2$ deg
$m = 9.2$
$L = 5.7$

(4)



$$F_1L_1 = F_2L_2 + F_3L_3$$

$$F_2L_2 = -F_3L_3 + F_1L_1$$

$$F_2 = \frac{-F_3L_3 + F_1L_1}{L_2} = \frac{-0.4(7.8) + .56(6.5)}{4.5}$$

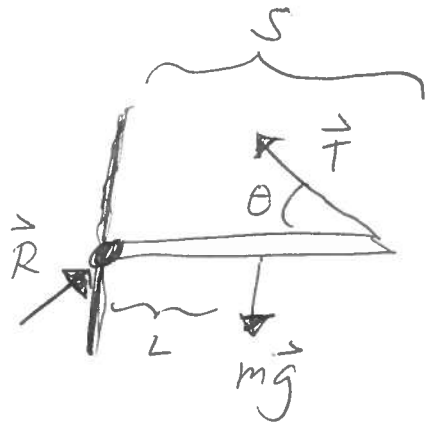
$$\boxed{F_2 = .116\,N}$$

(5) From problem (3) we have

$$mgL = TS\sin\theta$$

$$T\cos\theta = R_x$$

$$R_y = mg - T\sin\theta$$



Given: $S = 9.5\,m$, $\theta = 26.5^\circ$, $M = 6.8\,kg$, $L = 6.6\,m$

$R_y = mg - T\sin\theta$

$T = \dfrac{mgL}{S\sin\theta}$

} Solve for R_y

$$R_y = mg - mg\frac{L}{S} = mg\left(1 - \frac{L}{S}\right)$$

$$= (6.8)(9.8)\left\{1 - \frac{6.6}{9.5}\right\}$$

$$= 20.34\ N$$