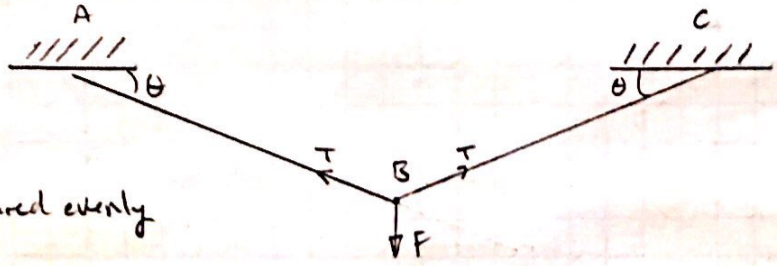
①

Given:

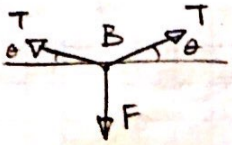


T shared evenly

Find: $T(\theta)$ as θ goes from $0 \rightarrow 60°$

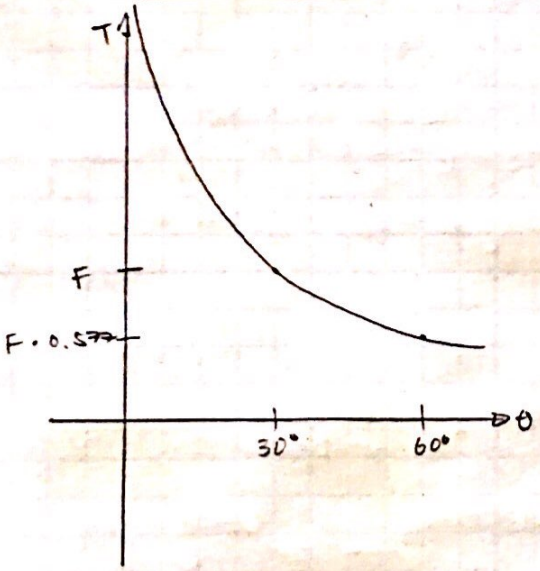
Solution:

FBD (B):



$$2T\sin\theta = F$$

$$\rightarrow \boxed{T = \frac{F}{2\sin\theta}}$$

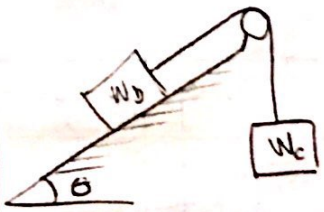


(2)

Given:

$W_c = 15\,lb$

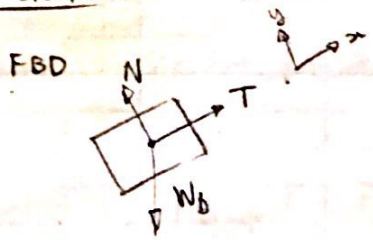
$\theta = 55°$



Find: weight of block, W_b

Solution:

FBD



let $N = W_b \cos\theta$

$T = W_b \sin\theta$

also, $T = W_c$

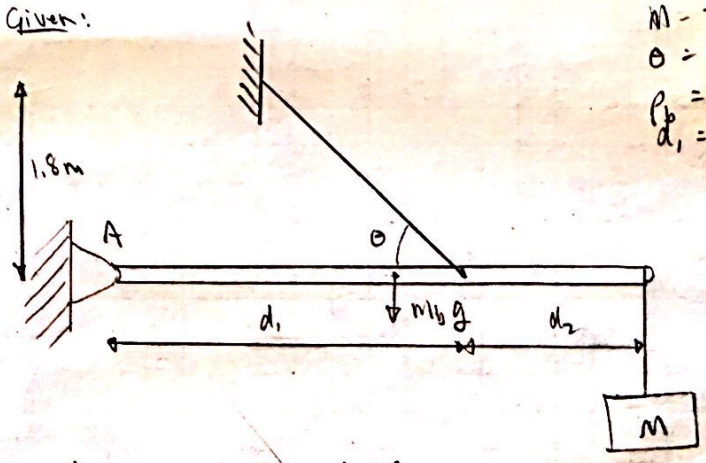
$\rightarrow W_c = W_b \sin\theta$

$$W_b = \frac{W_c}{\sin\theta}$$

$$\boxed{W_b = 26.15\,lb}$$

(3)

Given:

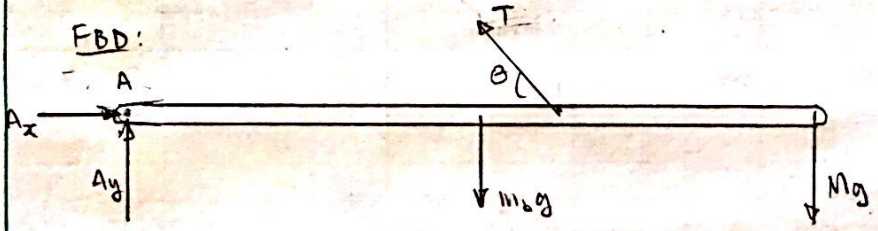


$M = 210\ kg$
$\theta = 45°$
$\rho_b = 25\ kg/m \rightarrow m_b = 140\ kg$
$d_1 = 3.8\ m \quad d_2 = 1.8\ m$

Find: reaction at pin A
tension in cable

Solution:

FBD:



$\Sigma F_x = 0 \rightarrow A_x - T\cos\theta = 0$
$\Sigma F_y = 0 \rightarrow A_y + T\sin\theta - g(m_b + M) = 0$

$$\Sigma M_A = 0 \rightarrow +Td_1\sin\theta - m_b g\left(\frac{d_1+d_2}{2}\right) - Mg(d_1+d_2) = 0$$

	A_x	A_y	T	C
→	1	0	$-\cos\theta$	0
	0	1	$+\sin\theta$	$g(m_b+M)$
	0	0	$d_1\sin\theta$	$g(d_1+d_2)\left(\frac{m_b}{2}+M\right)$

} used a python script

$A_x = 4043 \quad A_y = -608.8\ N \quad T = 5718\ N$

→ reaction at A: $A_x = +4043\ N$, $A_y = -608.8\ N$

Tension in cable: $T = 5718\ N$