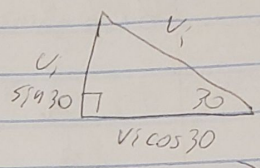
PHYS 407

1.

$6 = V_{ix} t \qquad -4 = -4.9t^2 + V_{iy} t$



$t = 6/v_i \cos 30$

$$0 = -4.9\left(\frac{6}{v_i \cos 30}\right)^2 + v_i \sin 30\left(\frac{6}{v_i \cos 30}\right) + 4$$

$$\frac{4.9}{1} \cdot \frac{6}{v_i \cos 30} \cdot \frac{6}{v_i \cos 30} + \frac{v_i \sin 30}{1} \cdot \frac{6}{v_i \cos 30} + \frac{4}{1}$$

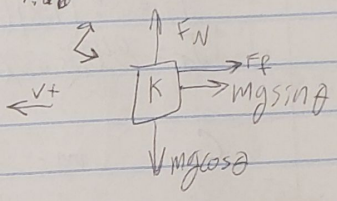
$$0 = \frac{176.4}{v_i^2 \cos 30^2 \, 0.75} + \frac{6 \sin 30}{\cos 30} + \frac{4}{1} \rightarrow \frac{176.4}{0.75 v_i^2} + \frac{3}{\cos 30} + \frac{4}{1} = 0$$

$$-4 - \frac{3}{\cos 3} = \frac{176.4}{0.75 v_i^2} \qquad v_i^2\left(-4 - \frac{3}{\cos 30}\right) = \frac{176.4}{0.75}$$

$-4 - 3.46 \qquad 235.2$

7.46

$$v_i = \sqrt{\frac{235.2}{-4 - 3/\cos 30}} \approx 5.61 \text{ m/s}$$



$W_{NC} = F_x \rightarrow F_f \qquad \mu = 0.2$

$F_f = \mu(mg\cos\theta) \qquad m_K = 30 \text{ kg} \qquad F_f = 50.92 \text{ N}$

$W_{NC} = 50.92(5) = 254.61$

$W_{NC} + mgh_i + \frac{1}{2}mv_i^2 + \frac{1}{2}kx_i^2 = mgh_f + \frac{1}{2}mv_f^2 + \frac{1}{2}kx_f^2$

$254.61 + \frac{1}{2}kx_i^2 = mgh_f + \frac{1}{2}mv_f^2 + \frac{1}{2}kx_f^2$

$\frac{1}{2}kx_i^2 - \frac{1}{2}kx_f^2 = mgh_f + \frac{1}{2}mv_f^2 - 254.61$

$k - k(25) = (30)(9.8)(4) + (0.5)(30)(5.61)^2 - 254.61$

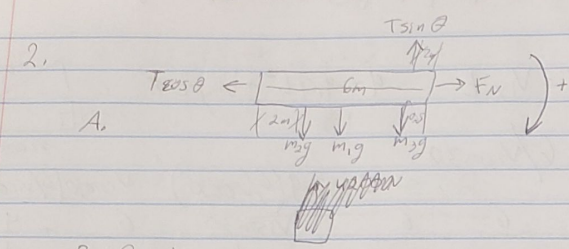
$1{,}176 \quad + \quad 472.08 \quad - 254.61$

$k - k(25) = 1{,}393.47 \qquad k = -58.06$

$58.06 \frac{N}{m}$

PHYS 407

2.



A.

B. 2, W_3 and F_N but we don't care about F_N

$$\Sigma \tau_A = \tau_1 + \tau_2 + \tau_3 - \tau_T = 0$$

$$+\tau_3 = -\tau_1 + \tau_2 + \tau_T$$

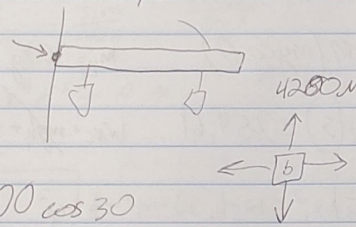
$\tau_1 = 120(9.8)(3) = 3528\ Nm$ $\quad \tau_3 = \tau_T - \tau_1 - \tau_2$

$\tau_2 = 50(9.8)(2) = 980\ Nm$

$\tau_3 = ?(9.8)(5.5) = 36,656\ Nm$

$\tau_T = 8400(\sin 30)(9.8)(4) = 41,164\ Nm$

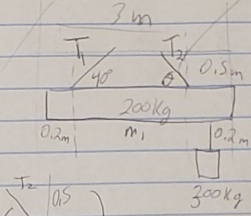
C. $m = 36686/53.9 = 680.07$ Kg

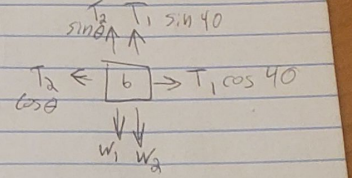


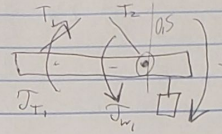
D. $8400\cos 30 = 7274.61\ N$

PHYS 407

3.







$$\Sigma \tau = \tau_{T_1} - \tau_{W_2} - \tau_{W_1} = 0$$

$$\Sigma \tau = T_{T_1} + T_{W_2} - T_{W_1} = 0$$

$T_{W_1} = 200 \cdot 9.8 \cdot 1 = 1960\ Nm$

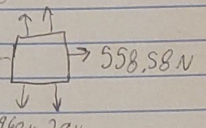
$T_{W_2} = 300 \cdot 9.8 \cdot 0.3 = 882\ Nm$

$T_{T_1} = T_{W_1} - T_{W_2} = 1078\ Nm \rightarrow 2.3\ m \rightarrow 468.7\ N$

$T_1 \sin 40 = 468.7\ N \quad T_1 = 729.17\ N \quad T_2 \sin\theta \quad 729.17\ N$

$T_2 \sin\theta + 729.17 = 2940 + 1960$

$-729.17 \quad -729.17$



$T_2 \sin\theta = 4170.83\ N \quad T_2 = \left(\frac{4170.83}{\sin\theta}\right)$

$T_2 \cos\theta = 558.58\ N \rightarrow \cos\theta = \left(\frac{558.58}{T_2}\right)$

$\cos^2 + \sin^2 = 1 \rightarrow \sin = \sqrt{1 - \cos^2} \rightarrow \sin = 1 - \cos$

$$T_2 = \frac{4170.83}{1 - \frac{558.58}{T_2}} \qquad T_2\left(1 - \frac{558.58}{T_2}\right) = 4170.83$$

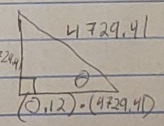
$$T_2 - \frac{558.58\ T_2}{T_2} = 4170.83 \qquad T_2 - 558.58 = 4170.83$$

$+558.58 \quad +558.58$

$T_2 = 4729.41\ N$

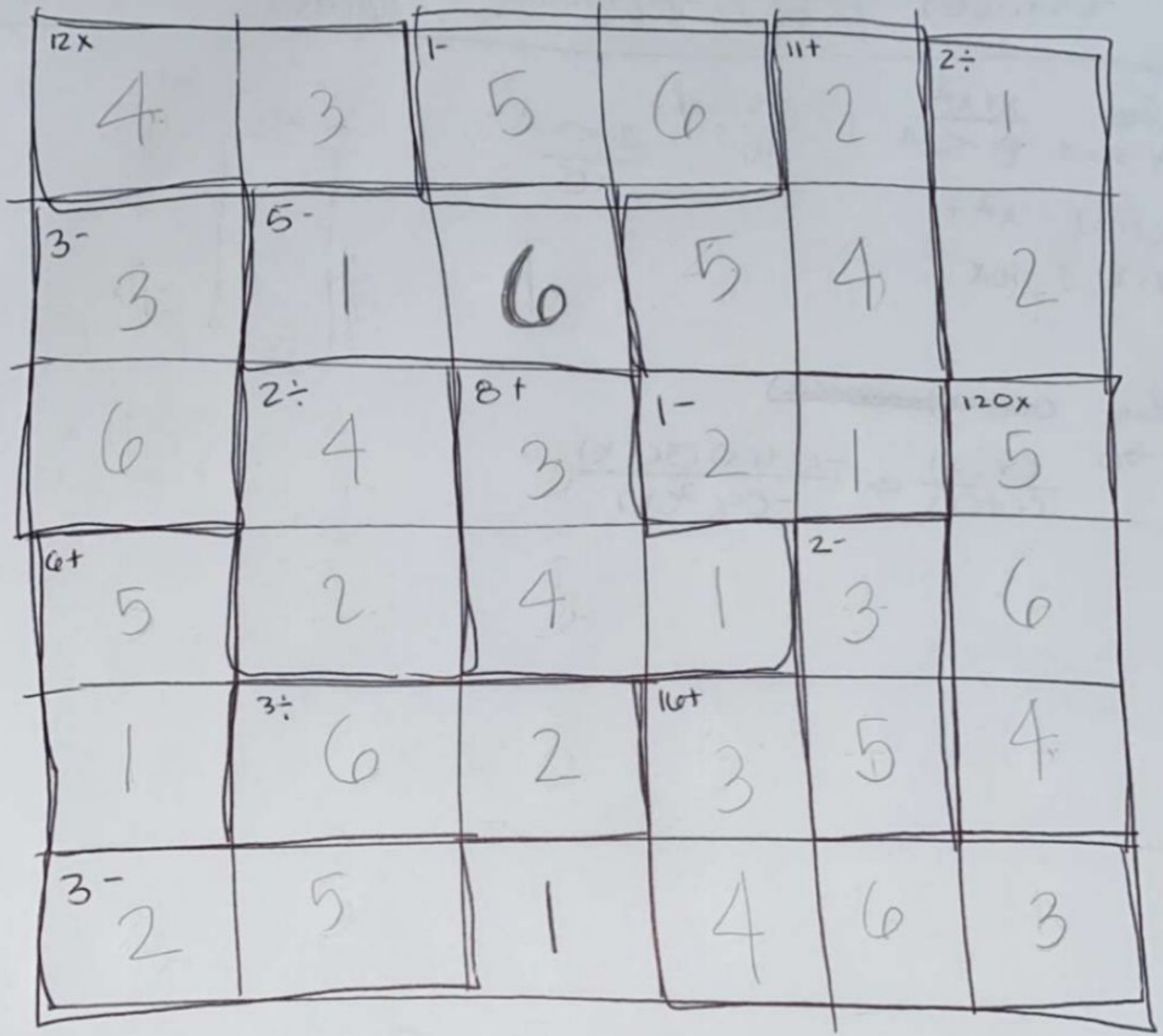
$\cos\theta = \left(\frac{558.58}{4729.41}\right) = 0.12$

$\sin\theta = 0.85$



$\tan^{-1}\left(\frac{4170.83}{558.58}\right)$

$\theta = 82.37°$


12x
4
3
1-
5
6
11+
2
2÷
1
3-
3
5-
1
6
5
4
2
6
2÷
4
8+
3
1-
2
1
120x
5
6+
5
2
4
1
2-
3
6
1
3÷
6
2
16+
3
5
4
3-
2
5
1
4
6
3