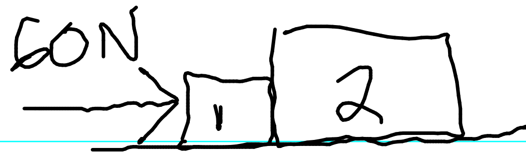
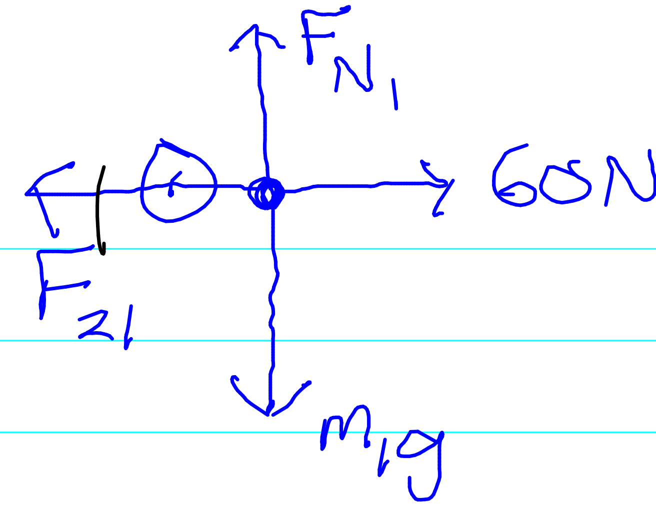
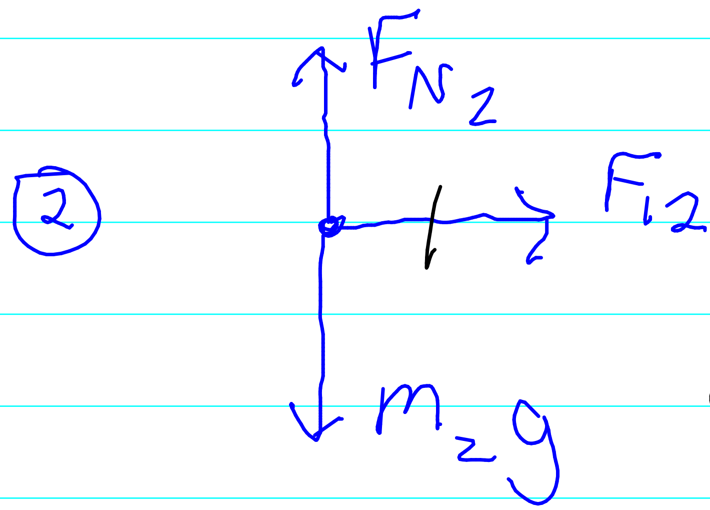
5-47)







① $m_1 a = 60N - F_{21}$

$0N = F_N - m_1 g$

② $m_2 a = F_{12}$

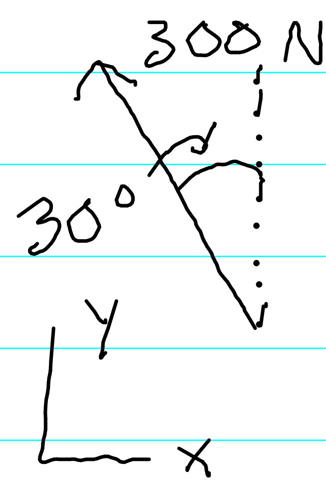
$0N = F_{N_2} - m_2 g$

① $(20Kg)a = 60N - (30Kg)a$

so $a = 1.2 \, m/s^2$

② $(30Kg)(1.2m/s^2) = 36N$

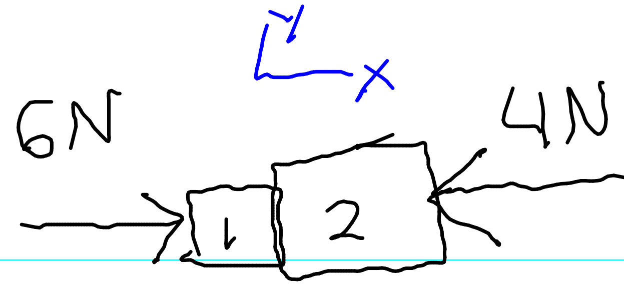
54)

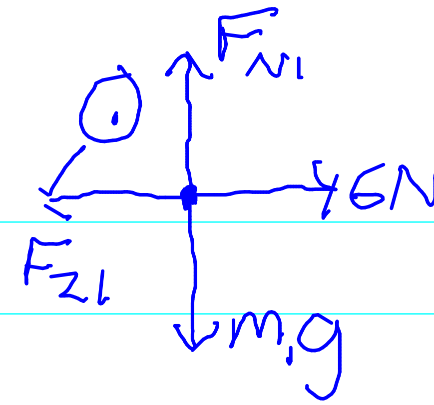


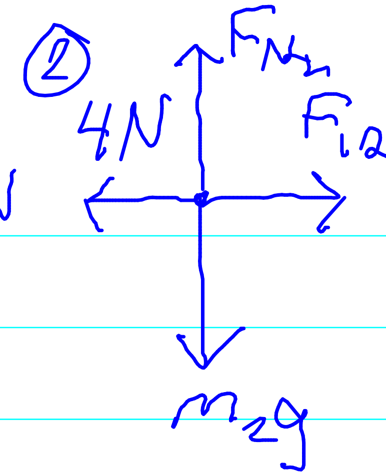
so $F_x = 300N \sin 30°$

$= 150N$

5-60)







① $m_1 a = 6N - F_{21}$

$0N = F_{N_1} - m_1 g$

② $m_2 a = F_{12} - 4N$

$0N = F_{N_2} - m_2 g$

① $m_1 a + m_2 a = 2N$

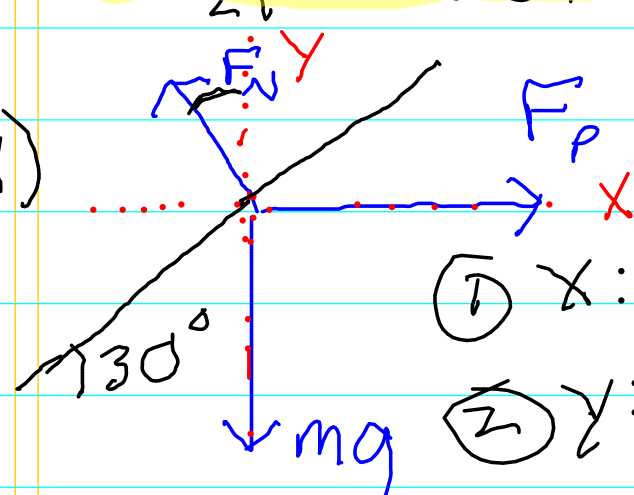
so $a = \dfrac{2N}{7kg}$

$a = .29\ m/s^2$

① $(3kg)(.29\ m/s^2) = 6N - F_{21}$

$F_{21} = .86N$

7)



① x: $0N = F_p - F_N \sin 30°$

② y: $0N = F_N \cos 30° - mg$

② $F_N = \dfrac{(60kg)(9.8\ m/s^2)}{\cos 30°} = 680N$

$F_p = 340N$

Chapter 6

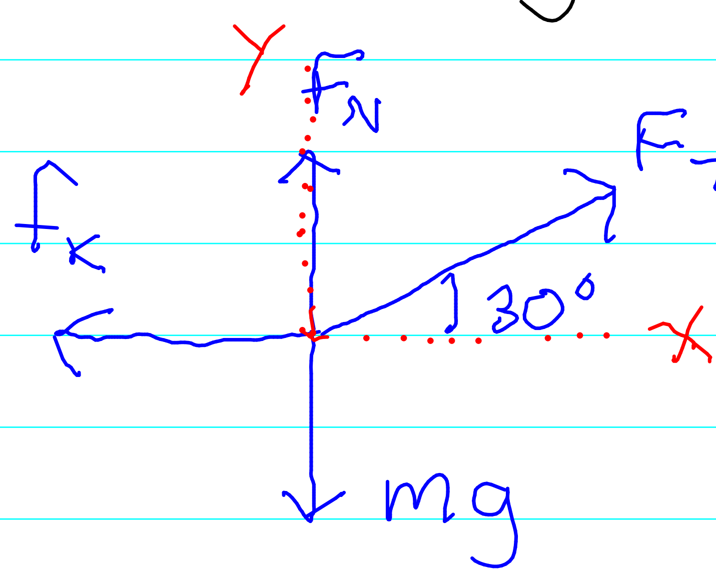
4) for friction to break down $f_s = \mu_s F_N$

$F_N = mg$ so $f_s = \mu_s mg$

Since $F = ma$, the acceleration is:

$\cancel{m}a = \mu_s \cancel{m}g \qquad a = .4g = 3.9\,m/s^2$

17)



$x: 0N = F_T \cos 30^\circ - \mu_K F_N$

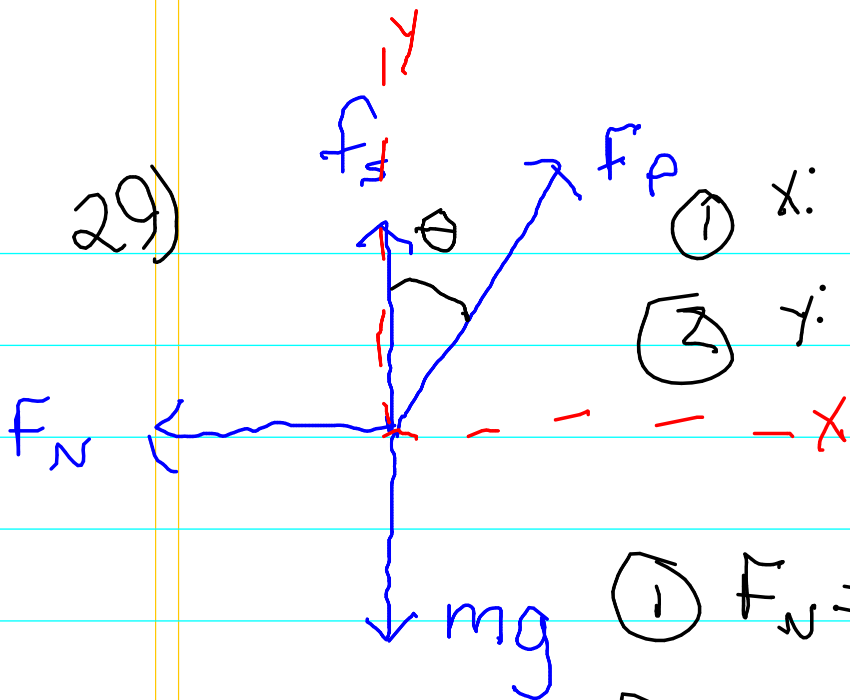
$y: 0N = F_N - mg + F_T \sin 30^\circ$

$y: F_N = mg - F_T \sin 30^\circ$ (put in X)

$x. F_T \cos 30^\circ = \mu_K (mg - F_T \sin 30^\circ)$

$$F_T = \frac{\mu_K mg}{\cos 30^\circ + \mu_K \sin 30^\circ} = 200\,N$$

29)



① x: $0N = F_p \sin\theta - F_N$

② y: $0N = \mu_s F_N + F_p \cos\theta - mg$

① $F_N = F_p \sin\theta$

② $mg = \mu_s(F_p \sin\theta) + F_p \cos\theta$

b) so $F_p = \dfrac{mg}{\cos\theta + \mu_s \sin\theta}$

c) $\dfrac{dF_p}{d\theta} = \left(mg\left(\cos\theta + \mu_s \sin\theta\right)^{-2}\right)(-2)$

$* (-\sin\theta + \mu_s \cos\theta) = 0$ (min)

when does $\mu_s \cos\theta - \sin\theta = 0$?

when $\mu_s = \tan\theta = \dfrac{\sin\theta}{\cos\theta}$

29-d) If $\theta \geq 90^\circ$ eq is still valid

$$F_p = \frac{mg}{\cos\theta + \mu_s \sin\theta}$$

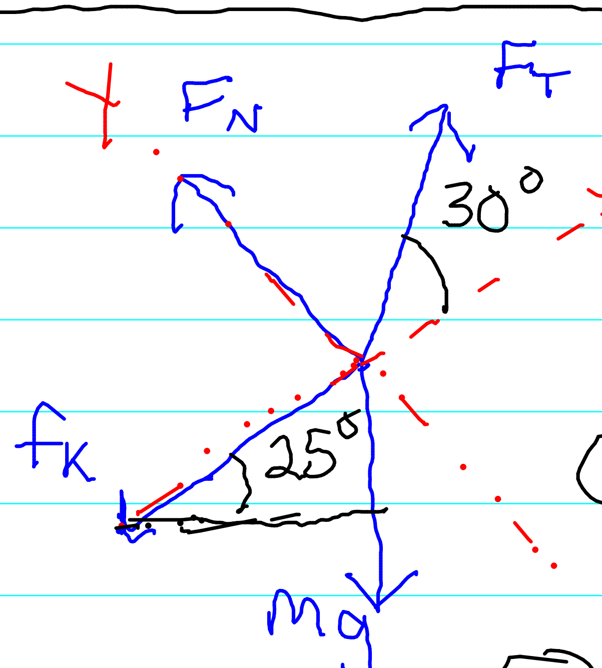
but $\cos\theta$ will be < 0

denominator cannot be negative or zero

$$\cos\theta = -\mu_s \sin\theta$$

so when $\mu_s = \frac{-\cos\theta}{\sin\theta}$ it becomes impossible

34)



① $0N = F_T \cos 30^\circ - f_K - mg\sin 25^\circ$

② $0N = F_T \sin 30^\circ + F_N - mg\cos 25^\circ$

③ $f_K = \mu_K F_N$

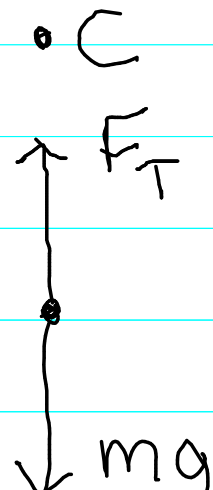
① $0N = F_T \cos 30^\circ - \mu_K(mg\cos 25^\circ - F_T \sin 30^\circ) - mg\sin 25^\circ$

$$F_T = \frac{mg(\sin 25^\circ + \mu_K \cos 25^\circ)}{\cos 30^\circ + \mu_K \sin 30^\circ}$$

6-38) $K = \dfrac{(1.5\,Kg)(9.81\,m/s^2)}{.2\,m} = 74\,N/m$

44) $\dfrac{(75\,Kg)(9.81\,m/s^2)}{2.9\,m} = 250\,N/m$

51)



$$\frac{mv^2}{r} = F_T - mg$$

$$\frac{(60\,kg)(5\,m/s)^2}{5\,m} = F_T - (60\,kg)g$$

so $F_T = 300\,N + 589\,N$

$= 889\,N$

6-54)

c ① $\frac{mv^2}{r} = F_N$

② $0N = f_s - mg$

② $\mu_s F_N = mg$ so $F_N = mg/\mu_s$

① $\frac{\cancel{m}v^2}{r} = \frac{\cancel{m}g}{\mu_s}$ so $v^2 = \frac{gr}{\mu_s}$

$v^2 = 235.4\, m^2/s^2$ so $V = 15.3\, m/s$

$C = 2\pi R$ $\quad d = vt$

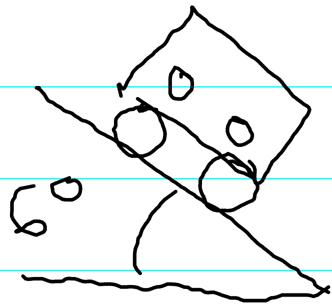
so $C = VT$ ← period

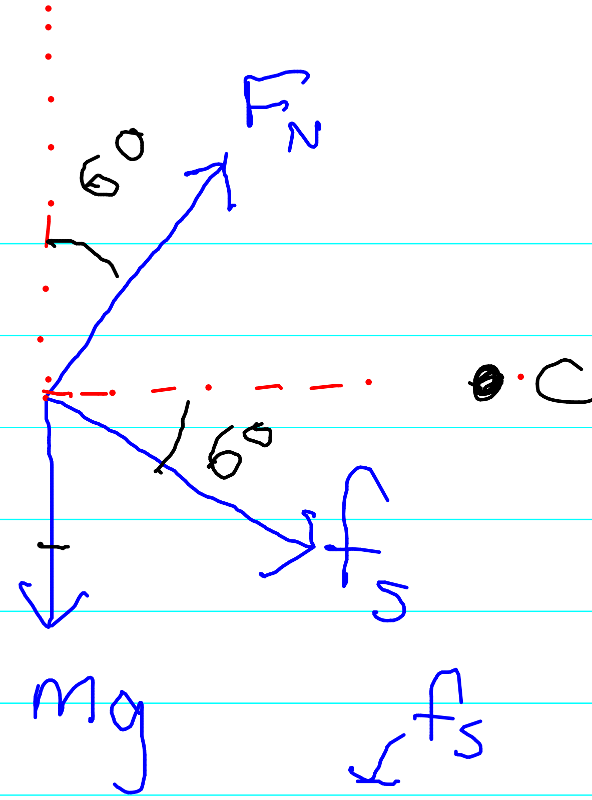
circumference

$T = 2.46$ seconds! so 24.4 rev/min

60s/(2.46 s/rev)

Ch 6.66)





f_s

① $\frac{mv^2}{r} = F_N \sin 6° + \mu_s F_N \cos 6°$

f_s

② $0N = F_N \cos 6° - \mu_s F_N \sin 6° - mg$

② $F_N = f_s \sin 6° + mg$

plug in ①

① $\frac{mv^2}{r} = (f_s \sin 6° + mg)\sin 6° + f_s \cos 6°$

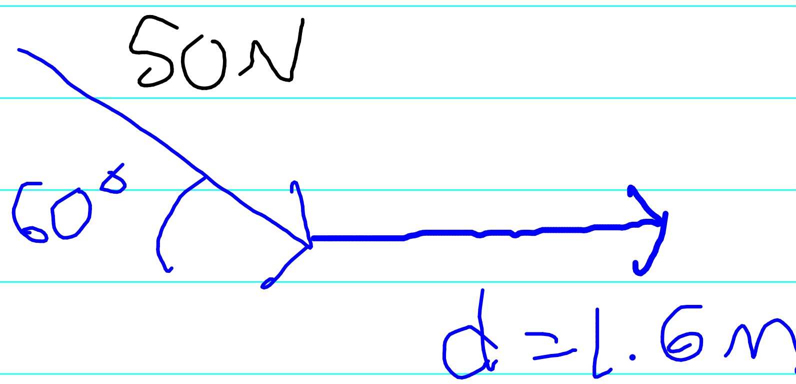
$f_s = \left(\frac{mv^2}{r} - mg \sin 6°\right) / (\sin^2 6 + \cos 6)$

$= 640N$

7-4) $2200 \text{ J} = (15\text{kg})(9.81 \text{ m/s}^2)h$

$h = 15 \text{ m}$

8)



$W = F \cdot d$

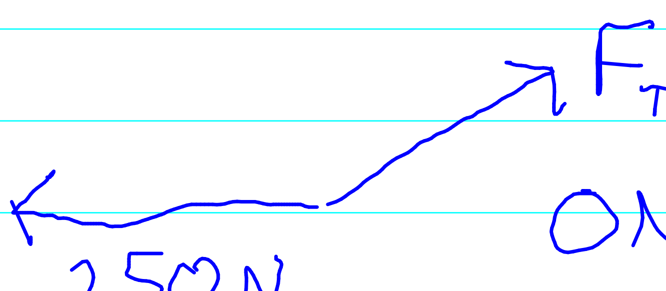
$= Fd\cos 60°$

$= 40 \text{ J}$

17) must compensate for friction

$W = (250 \text{ N})(50) = 12500 \text{ J}$

b)



$0 \text{N} = F_{Tx} - 250 \text{ N}$

so $F_{Tx} = 250 \text{ N}$

so $W = (250 \text{N})(50) = 12500 \text{ J}$

$F_T = 250 \text{N} / \cos 30° = 290 \text{ N}$