

# Homework 8 solutions



$$ma = \mu R \quad R = mg$$

$$\frac{mv^2}{r} = \mu mg$$

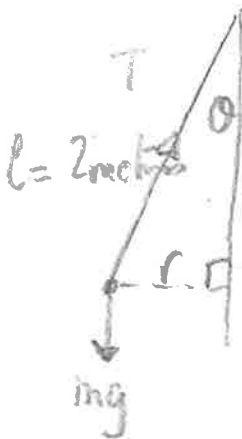
$$\mu = \frac{v^2}{gr}$$

$$\underline{\mu = 0.336}$$

$$v = 80 \text{ km/h}$$

$$v = 22.2 \text{ ms}^{-1}$$

2)



$$T \cos \theta = mg$$

$$\sin \theta = \frac{r}{2}$$

$$T \sin \theta = m \omega^2 r$$

$$r = 2 \sin \theta$$

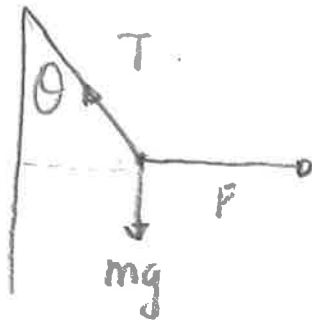
$$T \sin \theta = m \omega^2 \cdot 2 \sin \theta$$

$$\underline{T = 100 \text{ N}}$$

$$T \cos \theta = mg$$

$$\Rightarrow \underline{\theta = 78.7^\circ}$$

3)



$$T \cos \theta = mg$$

$$T = \frac{9}{\cos 30}$$

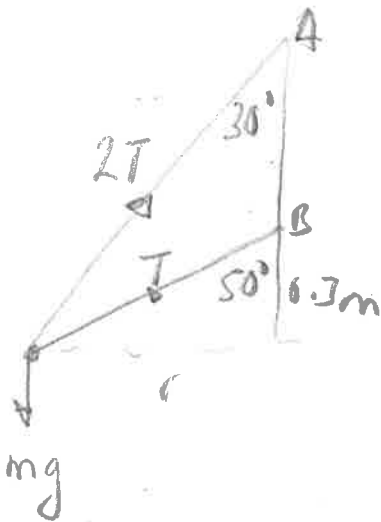
$$\underline{T = 10.4 \text{ N}}$$

$$T \sin \theta = F$$

$$F = 10.4 \times \sin 30^\circ$$

$$\underline{F = 5.2 \text{ N}}$$

4)



resolve vertically

$$T \cos 50 + 2T \cos 30 = 2g$$

$$2.37 T = 2g$$

$$\underline{T = 8.25 \text{ N}}$$

resolve horizontally

$$T \sin 50 + 2T \sin 30 = \frac{mv^2}{r}$$

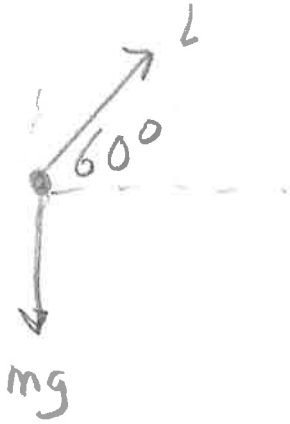
$$v^2 = 2.61$$

$$\underline{v = 1.61 \text{ ms}^{-1}}$$

$$\tan 50 = \frac{r}{0.3}$$

$$r = 0.3575 \text{ m}$$

5)

resolve vertically

$$L \sin 60 = mg$$

resolve horizontally

$$L \cos 60 = \frac{mU^2}{R}$$

$$\frac{L \sin 60 = mg}{L \cos 60 = \frac{mU^2}{R}}$$

$$\tan 60 = \frac{gR}{U^2}$$

$$\sqrt{3} = \frac{gR}{U^2}$$

$$R = \frac{\sqrt{3}U^2}{g}$$

$$T = \frac{2\pi R}{U}$$

$$T = \frac{2\pi\sqrt{3}U}{g}$$

6)



$$R = \frac{mv^2}{r}$$

$$\mu R = mg$$

$$R = m\omega^2 r \Rightarrow \mu m\omega^2 r = mg$$

$$\mu = \frac{g}{\omega^2 r}$$

$$\underline{\mu = 0.175}$$