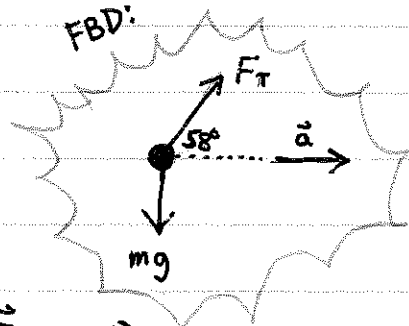
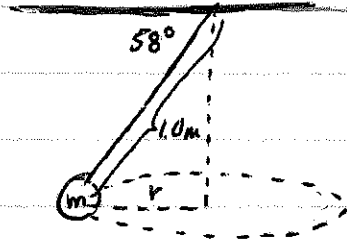


Uniform Circular Motion, Featuring 2D

1.



$$\hat{y}: \sum \vec{F}_y = 0$$

$$F_T \sin 58^\circ = mg$$

$$F_T = \frac{mg}{\sin 58^\circ}$$

$$F_T = 2.600088 \text{ N}$$

$$\hat{x}: \sum \vec{F}_x = m\vec{a}$$

$$F_T \cos 58^\circ = \frac{mv^2}{r}$$

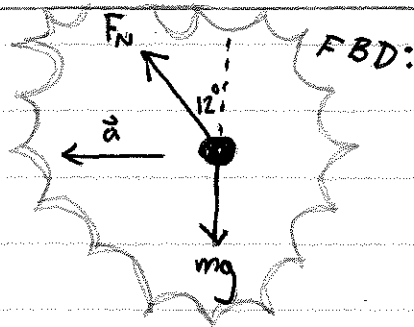
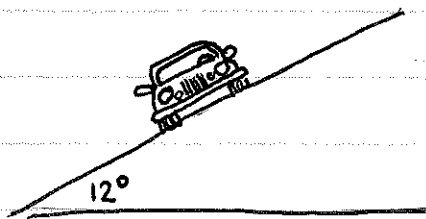
$$v = \sqrt{\frac{mg \cos 58^\circ (1.0 \text{ m} \cos 58^\circ)}{\cancel{m} \sin 58^\circ}} = 1.80409729 \dots$$

$$v = 1.8 \text{ m/s}$$

2.

$$v = 2.8 \text{ m/s}$$

3.



$$\hat{y}: \sum \vec{F}_y = 0$$

$$F_N \cos 12^\circ = mg$$

$$F_N = \frac{mg}{\cos 12^\circ}$$

$$\hat{x}: \sum \vec{F}_x = m\vec{a}$$

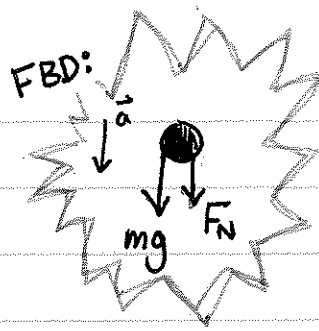
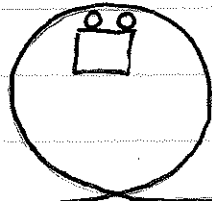
$$F_N \sin 12^\circ = \frac{mv^2}{r}$$

$$\underbrace{mg \frac{\sin 12^\circ}{\cos 12^\circ}}_{\tan 12^\circ} = \frac{mv^2}{r}$$

$$v = \sqrt{rg \tan 12^\circ}$$

$$v = 9.6 \text{ m/s}$$

4.



$$\sum \vec{F} = m\vec{a}$$

$$mg + F_N = \frac{mv^2}{r}$$

$$v = \sqrt{\frac{(mg + F_N)r}{m}}$$

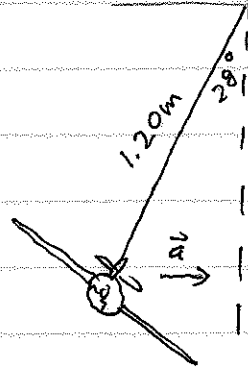
$$v = 8.3 \text{ m/s}$$

Text: 16. 73kg

20. 0.187

26. 170m

30. 45s



$$\hat{x}: \sum \vec{F}_x = ma$$

$$F_T \sin 28^\circ = \frac{mv^2}{r}$$

$$\frac{mg \sin 28^\circ}{\cos 28^\circ} = \frac{mv^2}{r}$$

$$v = 1.713347631 \text{ m/s}$$

$$\hat{y}: \sum \vec{F}_y = 0$$

$$F_T \cos 28^\circ = mg$$

$$F_T = \frac{mg}{\cos 28^\circ}$$

$$v = \frac{d}{t} = \frac{2\pi r}{T} \text{ (constant speed!)}$$

$$T = \frac{2\pi r}{v} = 2.06597431 \text{ s}$$

$$T = 2.1 \text{ s}$$