

$$x: \Sigma F = ma$$

$$F_T \sin \theta = m \frac{v^2}{r}$$

$$y: F_T \cos \theta = F_g \quad \text{* horizontal circle}$$

$\therefore$  sub  $y$  into  $x$

$$v^2 = rg \tan \theta$$

2.  $\Sigma F = m_{\text{mars}} \cdot a$

$$F_g = m_{\text{mars}} \cdot \frac{v^2}{r}$$

$$\frac{F_g \cdot r}{m_{\text{mars}}} = v^2$$

$$v = \frac{2\pi r}{T}$$

$$\therefore T = \frac{2\pi r}{v}$$

$$T(s) = \text{_____ (years)}$$

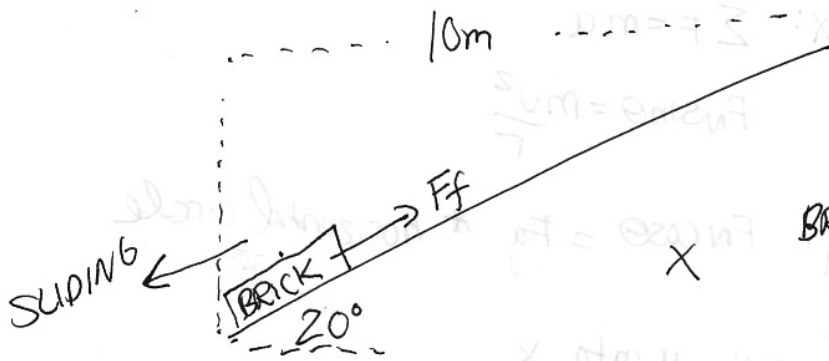
3.  $\Sigma F = ma$

$$F_{\text{arm}} = m_{\text{female}} \cdot \frac{v^2}{r} ; v = \frac{2\pi r}{T} = 2\pi r f$$

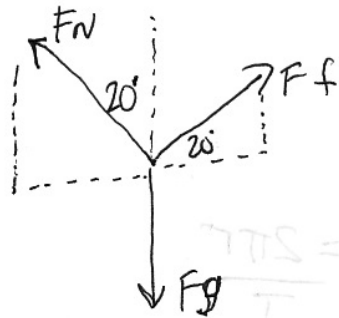
$$\therefore F_{\text{arms}} = m_{\text{female}} \cdot 4\pi^2 r f^2$$

$$\vec{F}_{\text{arms of female}} = -\vec{F}_{\text{arms of male}}$$

4.



BRICK NOT SLIDING OFF



$$x: -F_n \sin \theta + F_f \cos \theta = m \frac{v^2}{r}$$

↑  
anti-circle  
centre

↑  
towards  
center of  
rotation.

$$y: F_n \cos \theta + F_f \sin \theta - F_g = 0$$

↑  
NOT SLIDING

$$y: F_n \cos \theta + \mu F_n \sin \theta = mg$$

$$F_n (\cos \theta + \mu \sin \theta) = mg$$

$$F_n = \frac{mg}{\cos \theta + \mu \sin \theta}$$

$$x: \frac{-(mg)(\sin \theta)}{\cos \theta + \mu \sin \theta} + \frac{(\mu)(mg)(\cos \theta)}{\cos \theta + \mu \sin \theta} = m \frac{v^2}{r} \quad [v = 2\pi r f]$$

$$\therefore \frac{-g \sin \theta}{\cos \theta + \mu \sin \theta} + \frac{\mu g \cos \theta}{\cos \theta + \mu \sin \theta} = 2\pi^2 r f^2 \quad \leftarrow \text{sq root}$$

$$= f \text{ (Hz)}$$

$$= f \text{ (r.p. minute)}$$