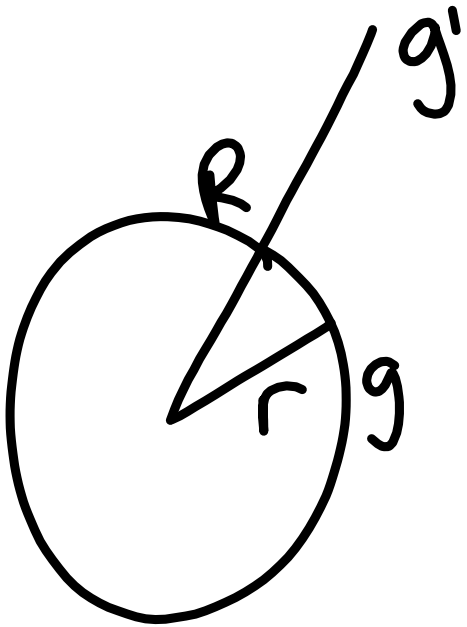
(5) $F_g = \frac{G m_1 m_2}{r^2} = m_1 g$

$g = \frac{G m_\oplus}{r_\oplus^2} \rightsquigarrow g = G m_\oplus \left(\frac{1}{r_\oplus^2}\right)$

also: $g \propto \frac{1}{r_\oplus^2}$ $g' = \frac{g}{2} \propto \frac{1}{R^2}$



$g \propto \frac{1}{r^2}$ $g' \propto \frac{1}{R^2}$

$gr^2 \propto 1$ $g'R^2 \propto 1$

$gr^2 = g'R^2$

$\frac{gr^2}{R^2} = \frac{g}{2}$ $\leftsquigarrow$ $\frac{gr^2}{R^2} = g'$

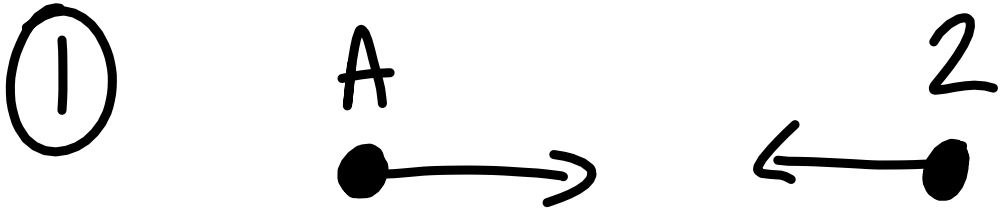
$$\frac{gr^2}{R^2} = \frac{g}{2}$$

$$\frac{r^2}{R^2} = \frac{1}{2}$$

$$2r^2 = R^2$$

$$\sqrt{2r^2} = R$$

$$r\sqrt{2} = R$$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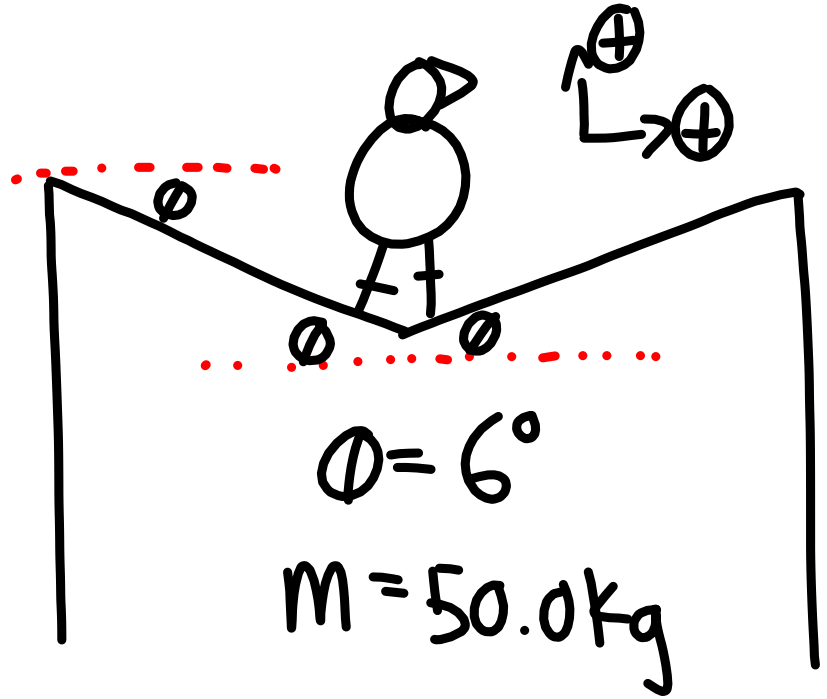
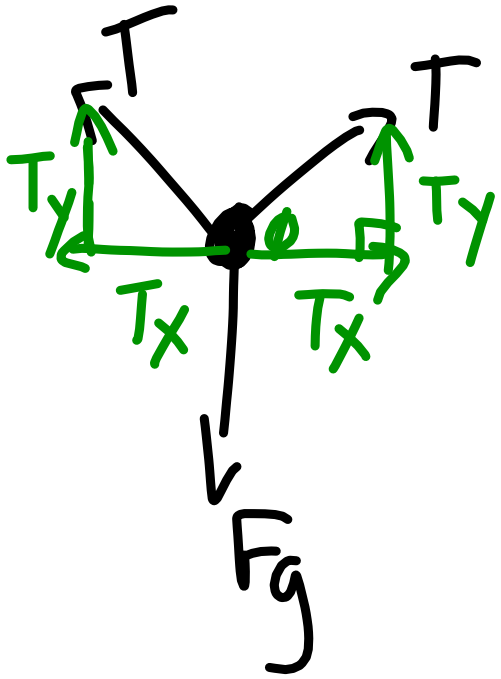
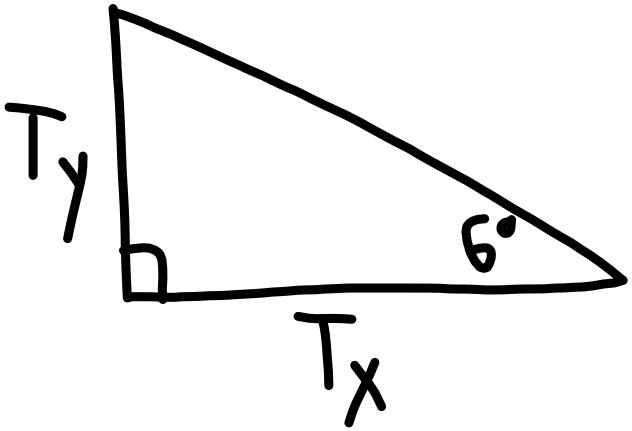




$T_y = T\sin\theta$

$T_x = T\cos\theta$



$\sin = \frac{O}{H}$

$H\sin = O$

$$\Sigma \vec{F}_x = -T_x + T_x = 0$$

$$T_x = T_x \rightsquigarrow T\cos\theta = T\cos\theta$$

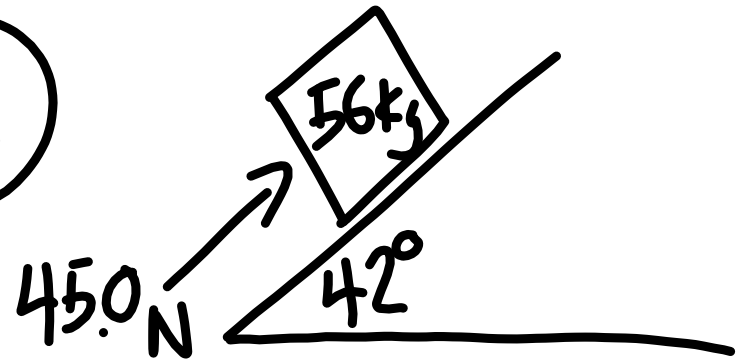
$$\Sigma \vec{F}_y = -F_g + 2T_y = 0$$

$$-mg + 2T\sin\theta = 0$$

$$2T\sin\theta = mg$$

$$T = \frac{mg}{2\sin\theta} = 2{,}350\,N$$

5



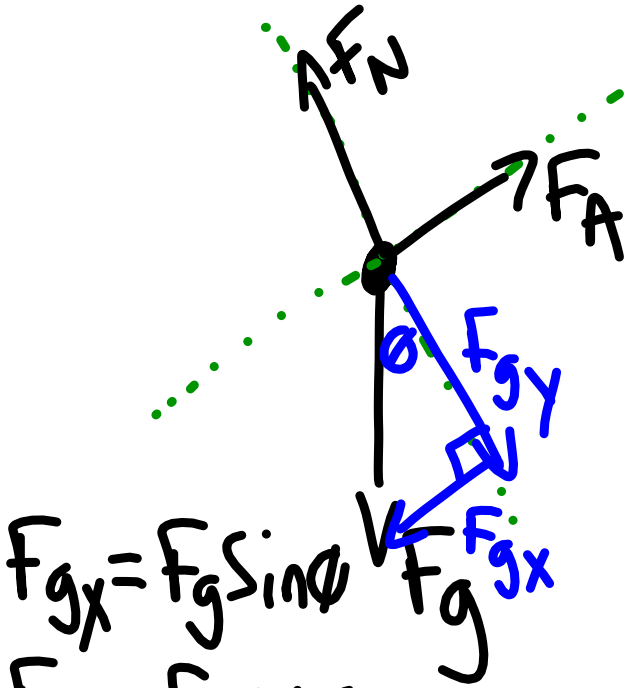
$\mu = 0.30$

$F_{gx} = F_g \sin(42°) = 367.6\,N$

$367.6 > 45$

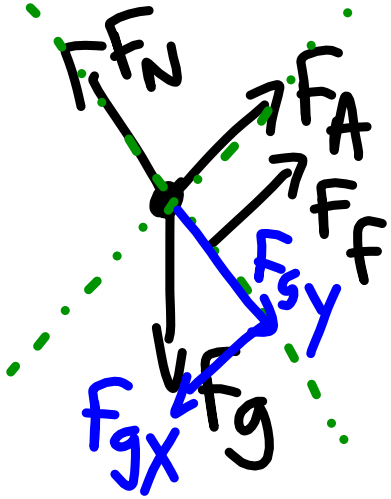
$\therefore$ Box moves

Down; F_f is up



$F_{gx} = F_g \sin\theta$

$F_{gy} = F_g \cos\theta$



$$\Sigma \vec{F}_y = -F_{gy} + F_N = 0$$

$$F_N = F_{gy} \rightsquigarrow F_N = F_g \cos\theta$$

$$\Sigma \vec{F}_x = -F_{gx} + F_A + F_f = ma$$

$$-mg\sin\theta + F_A + \mu F_g \cos\theta = ma$$

$$\frac{-mg\sin\theta + F_A + \mu F_g \cos\theta = a}{m}$$