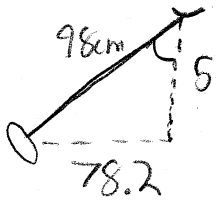
Physics Toys Inc.

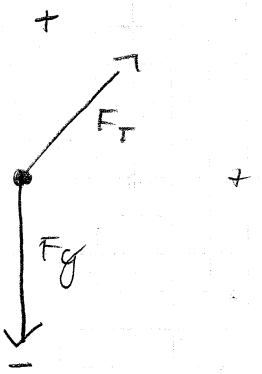
$\ell_{string} = 99cm$

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



$\theta = 37.06°$

$v = 2.037$



10 rev / 18.2 s

Assumptions:
- Perfect circle
- no air resistance
- constant velocity
- massless string

$m = 240g = .24kg$

$\frac{2.037^2}{0.5907}$

Calcs:

$F = ma$

$F_{net_y} = F_T \cos\theta - F_g$

$F_{net_x} = F_T \sin\theta$

$F_{net\,y} = 0 = F_T \cos\theta - F_g$

$F_T \cos\theta = F_g$

$F_T \cos\theta = .24kg(9.8 m/s^2)$

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

$\frac{m(2\pi rf)^2}{r} = F_T \sin\theta$

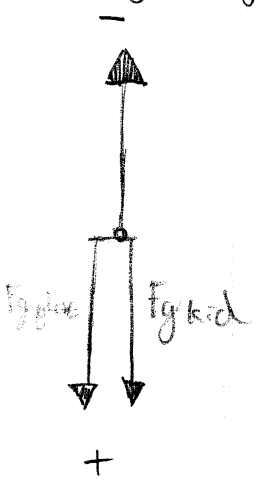
$\frac{4m\pi^2 r^2 f^2}{r} = F_T\left(\frac{r}{\ell}\right)$

$F_T = m\ell\omega$

$\frac{.24kg(2.037)^2}{.5907} = F_T \sin(37.06)$

$F_{Ty} = 2.947\,N$ minimum tensile strength in the string for basic use

Average weight of 3 year old: 13.5 kg



$F_{net} = F_{g\,plane} + F_{g\,body} - F_T$

$0 = .24kg(9.8 m/s^2) + 13.5(9.8) - F_T$

$F_T = 2.35N + 132.3N$

Recommended F_T for sale = 134.5N

This addition weight is to account for the chance that any kid using this would play by hanging on the airplane.