10. A 0.500 kg particle is connected by an ideal elastic bungee cord to a fixed vertical nail stuck into the centre of a frictionless horizontal table top. The elastic cord has an unstretched length of 0.400 m and a force constant of 650 N/m. If the particle is made to travel in a horizontal circular path at a uniform rate of 2.50 revolutions per second, find the <u>tension</u> in the cord. [Answer in N.]

$$\ell = 0.400m + x \implies F_{spring} = -kx$$

$$\vec{T} = kx \rightsquigarrow a = \frac{v^2}{r}$$
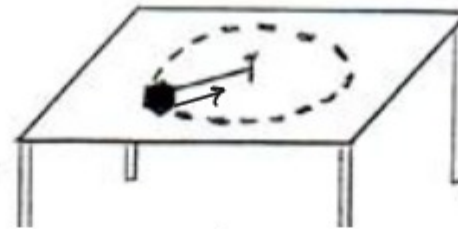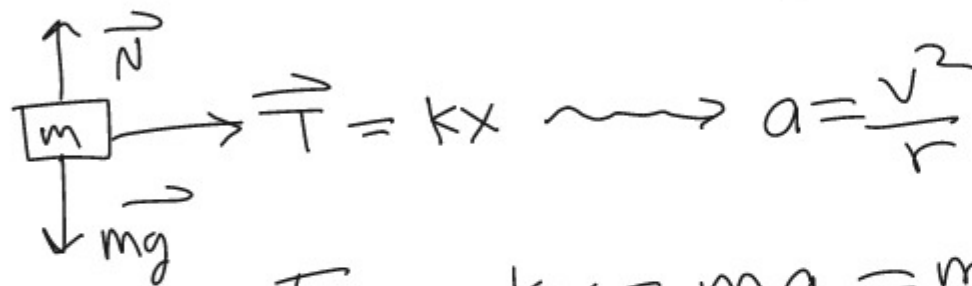
$$F_{Net} = kx = ma = m\frac{v^2}{r}$$

$$x = \frac{mv^2}{kr} = \frac{m(2\pi r f)^2}{kr} = \frac{4m\pi^2 r f^2}{k} = \frac{4(0.5kg)\pi^2\, 0.4m\,(2.5^2 \frac{rev^2}{s^2})}{650\frac{N}{m}}$$

12.5 rev in 5 seconds.
12.5 rev = how many metres of travel?

$$2\pi r \frac{m}{rev}\left(12.5 \frac{rev}{5s}\right) = 2\pi r f\left[\frac{m}{s}\right]$$

$$x = 0.0937 1m$$

$$T = kx = 60.9 N$$

miro