9.

$d = 2.2m$

$x_1 = 1.1cm = .011m$

$\cancel{\tfrac{1}{2}}kx^2 = \cancel{\tfrac{1}{2}}mv_f^2$

$kx^2 = mv^2$

$kx_1^2 = m\frac{d_1^2}{t^2}$

$kx_2^2 = m\frac{d_2^2}{t^2}$

$\frac{\cancel{k}x_2^2}{\cancel{k}x_1^2} = \frac{\cancel{m}\frac{d_2^2}{\cancel{t^2}}}{\cancel{m}\frac{d_1^2}{\cancel{t^2}}} \rightarrow \frac{x_2^2}{x_1^2} = \frac{d_2^2}{d_1^2} \longrightarrow x_2 = \frac{d_2 x_1}{d_1}$

.011m compression $= 2.2 - .27 = 1.93m$ travelled

$x_1 = .011m$ $\quad x_2 = ?$

Because all other factors are held constant between x_1, which is Bobby's compression of the spring, and x_2, which is Rhoda's compression of the spring, the only variables needed are x_1, d_1 (Bobby's distance), x_2, and d_2 (Rhoda's distance).

$x_1 = .011m$ $\quad d_1 = 1.93m$

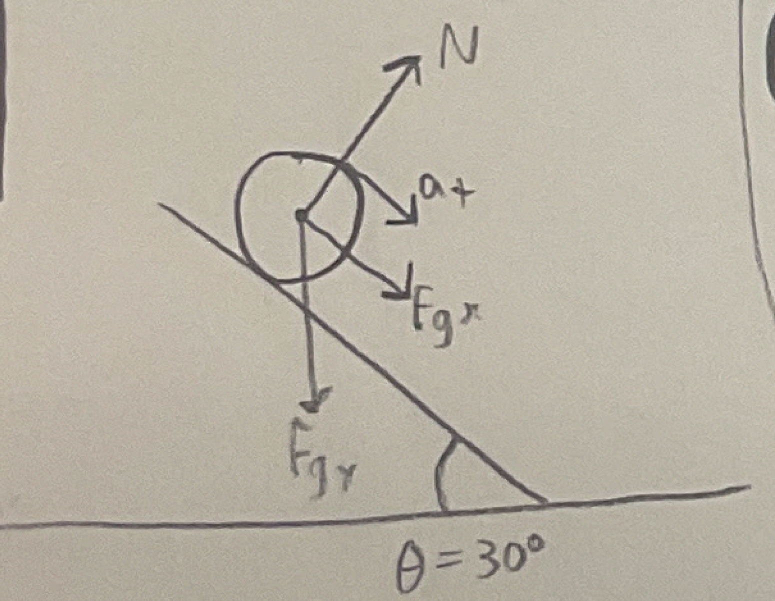
$x_2 = ?\,m$ $\quad d_2 = 2.2m$

$= \frac{2.2(.011)}{1.93}$

$= .0125m$

$\boxed{= 1.25\text{ cm}}$

10.



(a) $\alpha = g\sin(\theta)$

$\alpha = \frac{a_t}{r}$

$\frac{a_t}{r} = g\sin(\theta)$

$a_t = r \cdot g\sin(\theta)$

$a_t = 0.2(10)\sin(30)$

$a_t = 1m/s^2$

(b)

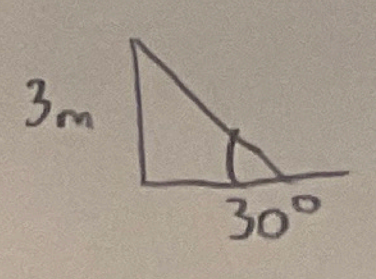
$KE_{tot} = PE_i = KE_{rot} + KE_{lin}$

$KE_{rot} = PE_i - KE_{lin}$

$= mg\Delta h - \frac{1}{2}mv_f^2$

$v_f^2 - v_i^2 = 2a\Delta x$ $\quad v_i = 0$

$\rightarrow v_f^2 = 2(1)\left(\frac{3}{\sin(30)}\right)$



$\sin(30°) = \frac{3}{\Delta x}$

$\Delta x = \frac{3}{\sin(30°)}$

$KE_{rot} = 2(10)(3) - \frac{1}{2}(2)\left(2 \cdot 1 \cdot \frac{3}{\sin(30)}\right)$

$KE_{rot} = 60 - 12$

$\boxed{KE_{rot} = 48\text{ J}}$ (b)