Checkpoint: 

Is it possible to place fingers on the frets to have the lowest string have the same frequency as the highest?

No $v = \lambda f$

speed of high string is 4x low. Mass/unit density $\mu = ?$

$v^2 = \frac{T}{\mu} \rightarrow \mu = \frac{T}{v^2}$ $\quad \mu_H = \frac{T}{16v^2}$ $\quad \mu_L = \frac{T}{v^2}$

$\frac{\mu_H}{\mu_L} = \frac{T/16v^2}{T/v^2} = \frac{1}{16}$ $\quad \mu_L = 16\mu_H$

so $d_{low}^{diameter} = 4 \cdot d_{high}$ $\quad M = \mu V = \mu L \pi r^2$

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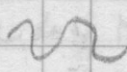
3)  $m = 0.86\,kg$ $\quad L_{stretched} = 7.9m$

$A = 0.2m$ $\quad t_{length} = 0.462s$ $\quad f = 0.45\,Hz$

a) v wave?

$7.9 / 0.462 \approx \boxed{17\,m/s}$

b) $T_{slinky}^{tension}$?

$v = \sqrt{\frac{T}{\mu}}$ $\quad v^2\mu = T$ $\quad T = 17^2 \cdot \frac{0.86\,kg}{7.9m} \approx \boxed{31.8N}$

c) Average speed of apiece of slinky:

Distance in 1 period.  $4A = 0.8m$

period $P = \frac{1}{f} \approx 2.2s$

speed$_{avg}$ $= 0.8 / 2.2 = \boxed{0.36\,m/s}$

a) wavelength? $v = \lambda f$ $\quad 17 = \lambda(0.45)$ $\quad \boxed{\lambda \approx 38m}$

d) Stretched to 2L. New tension?

$F = kx$

$\frac{31.8}{7.9} = k$ $\quad k \approx 4.025$ $\quad F = 4.025(7.9 \cdot 2) = \boxed{63.6\,N}$

f) New mass dens. by? $\mu = \frac{0.86\,kg}{15.8m} \approx \boxed{0.054\,kg/m}$

g) new time to travel down slinky?

$v = \sqrt{\frac{T}{\mu}} = \sqrt{\frac{63.6N}{0.054}} \approx 34.18\,m/s$ $\quad \frac{15.8m}{34.18} \approx \boxed{0.46s}$

h) wavelength if f is the same? $\quad 34.18 = \lambda(0.45)$

$\lambda = 75.96$