A university physics professor buys 100 m of string and determines its total mass to be 0.150 kg. This string is used to set up a standing wave laboratory demonstration between two posts 3.0 m apart. If the desired second harmonic frequency is 35 Hz , what should be the required string tension?

Solution:

Fundamental frequency is $\left(\frac{35}{2}\right) Hz$.

$f = \left[\frac{1}{2L}\right] * \sqrt{\left(\frac{T}{m}\right)}$ where m is mass per unit length

$m = \dfrac{0.15}{100} = 0{,}0015 \dfrac{kg}{m}$

$\left(\dfrac{35}{2}\right) = \left[\dfrac{1}{2*3}\right]\sqrt{\left(\dfrac{T}{0{,}0015}\right)}$

Solving
$T = 16{,}54\ N$

Answer: $T = 16{,}54\ N$.