80. (a) We proceed by dividing the (velocity) equation involving the new (fundamental) frequency f' by the equation when the frequency f is 440 Hz to obtain

$$\frac{f'\lambda}{f\lambda} = \sqrt{\frac{\frac{\tau'}{\mu}}{\frac{\tau}{\mu}}} \implies \frac{f'}{f} = \sqrt{\frac{\tau'}{\tau}}$$

where we are making an assumption that the mass-per-unit-length of the string does not change significantly. Thus, with $\tau' = 1.2\tau$, we have $f'/440 = \sqrt{1.2}$. Therefore, $f' = 482$ Hz.

(b) In this case, neither tension nor mass-per-unit-length change, so the wavespeed v is unchanged. Hence,

$$f'\lambda' = f\lambda \implies f'(2L') = f(2L)$$

where Eq. 18-38 with $n = 1$ has been used. Since $L' = \frac{2}{3}L$, we obtain $f' = \frac{3}{2}(440) = 660$ Hz.