34. (a) The fundamental frequency of a string can be increased (for instance, going from A up to C) by shortening the length of the vibrating portion of the string. When the note C is played, the vibrating length is (using Eq. 17-53)

$$\frac{f'}{f} = \frac{nv/2L'}{nv/2L} \quad \Longrightarrow \quad L = (30\,\text{cm})\left(\frac{440\,\text{Hz}}{528\,\text{Hz}}\right) = 25\ \text{cm}\ .$$

Thus, one should place his finger a distance of $30\,\text{cm} - 25\,\text{cm} = 5\,\text{cm}$ from one end of the string.

(b) Since $v = f\lambda$, the ratio of wavelengths is the reciprocal of the frequency ratio, so that $\lambda_\text{A}/\lambda_\text{C} = 528\,\text{Hz}/440\,\text{Hz} = 1.2$.

(c) This has the same answer as part (b), due to the fact that the frequencies are the same on the string and the air (transmitting a signal from one medium to another does not generally change its frequency. Both wavelengths are larger (*much* larger) in the air than on the string, but their ratio (due to $v = f\lambda$) remains the same.