

b). she have to increase the tension slowly and listen to a decrease in the number of beats against the tuning fork. When the beats are no longer audible the cord is properly tuned.

4. a) Because the two waves emerge from the same source, they must emerge in phase with each other.

Key idea: when they merge at point Q, their phase difference can depend only on the path length difference ΔL between the two paths they followed. To reach Q, the wave following path A travels distance $3d$, and the wave following path B travels $7d$, thus, $\Delta L = 4d$.

\therefore If the waves are to be exactly out of phase at Q, we must have

$$\frac{\Delta L}{\lambda} = 0.5, 1.5, 2.5, \dots$$

$$\therefore \Delta L = 4d \Rightarrow d = \frac{1}{8}\lambda, \frac{3}{8}\lambda, \frac{5}{8}\lambda, \dots$$

b) similarly, exactly in phase at Q,

$$\frac{\Delta L}{\lambda} = 0, 1, 2, 3, \dots$$

we can eliminate 0 from the list, ($\Delta L = 0$), then solving for d,

$$d = \frac{1}{4}\lambda, \frac{1}{2}\lambda, \frac{3}{4}\lambda, \dots$$