AP Physics 1
Wave Practice Problems

1.) A wave of frequency f_1 and wavelength λ_1 passes through a medium in which its speed is v to another medium in which its speed is $2v$. What are the frequency and wavelength of the wave in the second medium?

2.) A wave of amplitude 0.75 m interferes with a second wave of amplitude 0.53 m.

a.) Find the maximum possible amplitude of the resultant wave if the interference is constructive.

b.) Find the maximum possible amplitude of the resultant wave if the interference is destructive.

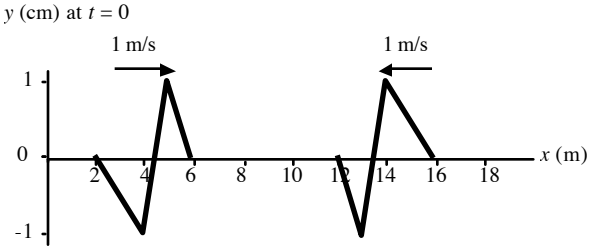
3.) Larry dips Rat's tail into a pan of water twice each second, producing waves with crests that are separated by 0.15 m. Determine the frequency, period, and speed of these water waves.

4.) A wave has a frequency of 360 Hz and a wavelength of 0.25 m. What is the speed of the wave?

5.) The distance between two successive crests of a certain transverse wave is 1.20 m. Eight crests pass a given point along the direction of travel every 12.0 s. Calculate the wave speed.

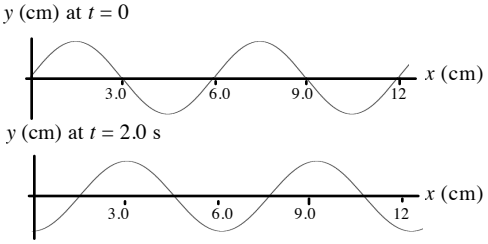
6.) Trouble and Bebop are fishing in a boat anchored in a lake 24 m from shore. Trouble observes that the boat rocks through 11 complete oscillations in 19 s and that one wave crest passes the boat with each oscillation. Bebop notes that each crest takes 6.5 s to reach the shore. What is the period and wavelength of the surface wave?

7.)



The figure to the left shows a snapshot graph at $t = 0$ s of two waves approaching each other at 1 m/s. Draw four snapshot graphs, showing the string at $t = 2$, 4, 6, and 8s.

8.)



The figure to the left shows snapshots of a traveling wave at $t = 0$ and $t = 2.0$ s.

a.) What is the wavelength of the wave?

b.) What is the period of the wave?

c.) What is the speed of the wave?

9.) A 120 cm length of string is stretched between fixed supports. What are the three longest possible wavelengths for traveling waves on the string that can produce standing waves?

10.) What is the speed of a transverse wave in a rope of length 2.00 m and mass 60.0 g under a tension of 500 N?

11.) A string vibrates with a frequency of 25.0 Hz in its fundamental mode when the supports to which the ends of the string are tied are 0.800 m apart.

a.) What is the speed of propagation of a transverse wave in the string?

b.) If the string has a mass of 50 g, what is the tension in the string?

12.) A string has a linear density of 0.535 kg/m and is stretched with a tension of 45.0 N. A wave with a frequency of 120 Hz is traveling along the string.

a.) Find the speed for this wave. b.) What is the wavelength of this wave?

13.) A bass guitar string is 89.0 cm long with a fundamental frequency of 30.0 Hz. What is the wave speed on this string?

14.) What are the three lowest frequencies for standing waves on a wire 10.0 m long having a mass of 100 g, which is stretched under a tension of 250 N?

15.) If one doubles the tension in a violin string, by what factor will the fundamental frequency of that string change?

16.) A stretched string is observed to have three antinodes in a standing wave driven at a frequency of 480 Hz. What driving frequency will set up a standing wave with four antinodes?

17.) A string fixed at both ends is 8.40 m long and has a mass of 0.120 kg. It is subjected to a tension of 96.0 N and set oscillating.

a.) What is the speed of the waves on the string? b.) What is the longest possible wavelength for a standing wave?

c.) Find the frequency of the third harmonic for this string.

18.) Vibration from a 600 Hz tuning fork sets up standing waves in a string clamped at both ends. The wave speed for the string is 450 m/s. The standing wave has four loops and an amplitude of 2.0 mm.

a.) What is the fundamental frequency for the string? b.) What is the frequency of the second harmonic?

c.) What is the length of the string?

19.) A string fixed at both ends is 0.840 m long and is oscillating such that there are 9 nodes present along the string (including the end points). The tension and linear density are such that the wave velocity is 84.0 m/s.

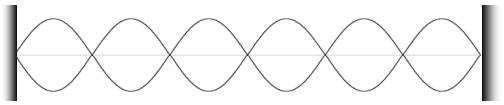
a.) What is the wavelength of the standing wave pattern?

b.) What is the fundamental frequency of the string assuming the same tension and wave velocity?

20.) A string is fixed at both ends such that the tension in the string is 500 N. When the string is excited using a 384 Hz tuning fork, a standing wave pattern is formed containing 6 antinodes with a wave speed of 128 m/s.

a.) What is the fundamental frequency of vibration?

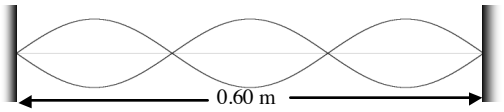
b.) What is the length and mass of the string?

21.) 

A 2.00 m long string is fixed at both ends and tightened until it has a wave speed of 40.0 m/s. A standing wave shown to the left is formed by an unknown frequency on the string.

a.) What is the wavelength of the wave? b.) What is the frequency of the wave?

c.) What is the lowest frequency that would excite a standing wave on the string?

22.) 

The figure to the left shows a standing wave oscillating at 100 Hz on a string. What is the wave speed?