Section
13-3

HOLT PHYSICS
Diagram Skills

Harmonics

1. A 52.0 cm long guitar string has a fundamental frequency of 444 Hz.

   a. What is the speed of sound in the string according to these data?

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   b. In the space below, draw the standing wave pattern for the first, the second, and the third harmonics, showing the nodes and the antinodes on the string.

   c. What should be the string's length in order to produce a fundamental note of 333 Hz?

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2. The first harmonic frequency of a violin string is 440 Hz.

   a. Find the next harmonic frequencies (overtones) of this string.

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   b. The intensities of the second and third harmonics are about half that of the fundamental one. Sketch a graph of each wave and a graph of their combination to show the resultant waveform for this violin string.