

### 3.10.2.2: Plucked String Simulation

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In this simulation a set of initial conditions for a vibrating string can be chosen. The first is the fundamental frequency of the string, the second is the second harmonic. The third and fourth initial conditions simulate plucking in the center and at a location one fourth of the way along the string.

#### Simulation Questions:

1. Run the fundamental and second harmonic initial conditions. How are standing waves formed on a string?
2. How many sine wave Fourier components are present in the case of the fundamental?
3. Which Fourier components are present if the string vibrates in the second harmonic mode?
4. Now look at the case of the string plucked in the center. What is the initial shape? Based on your experience with the triangle wave forms in the Waveform simulation in Chapter 9, do you expect the string plucked at the center to sound different from the fundamental or second harmonic? Explain.
5. Now look at the case of the string plucked off-center. Which wave is this similar to in the Waveform simulation in Chapter 9?
6. Based on what you know from the Fourier simulation in Chapter 9, what would you expect the Fourier components to look like? (Hint; Do Fourier simulation question seven.)
7. Based on your experience with listening to the wave forms in the Waveform simulation in Chapter 9, do you expect the string plucked off-center to sound different from the fundamental or second harmonic? Will it sound different from the string plucked in the center? Explain.

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