WAVE INTERFERENCE

IT'S INTRIGUING THAT at a lively party with everyone talking at once, you can hear the totality of the "noise" in the room and then alternately distinguish and concentrate on the conversation of one person. That is because of an interesting phenomenon of waves called **superposition**. Wave superposition occurs when two or more waves move through the same space in a wave medium together. There are two important aspects of this wave superposition. One is that each wave maintains its own identity and is unaffected by any other waves in the same space. This is why you can pick out an individual conversation among all the voices in the region of your ear. The second aspect is that when two or more waves are in the same medium, the overall amplitude at any point on the medium is simply the sum of the individual wave amplitudes at that point. Figure 1.8 illustrates both of these aspects. In the top scene, two wave pulses move toward each other. In the second scene the two pulses have reached the same spot in the medium and the combined amplitude is just the sum of the two. In the last scene, the two wave pulses move away from each other, clearly unchanged by their meeting in the second scene.

When it comes to music, the idea of interference is exceptionally important. Musical sounds are often constant frequencies held for a sustained period. Sound waves interfere in the same way other waves, but when the sound waves are musical sounds (sustained constant pitches), the resulting superposition can sound either pleasant (consonant) or unpleasant (dissonant). Musical scales consist of notes (pitches), which when played together, sound consonant. We'll use the idea of sound wave interference when we begin to look for ways to avoid dissonance in the building of musical scales.

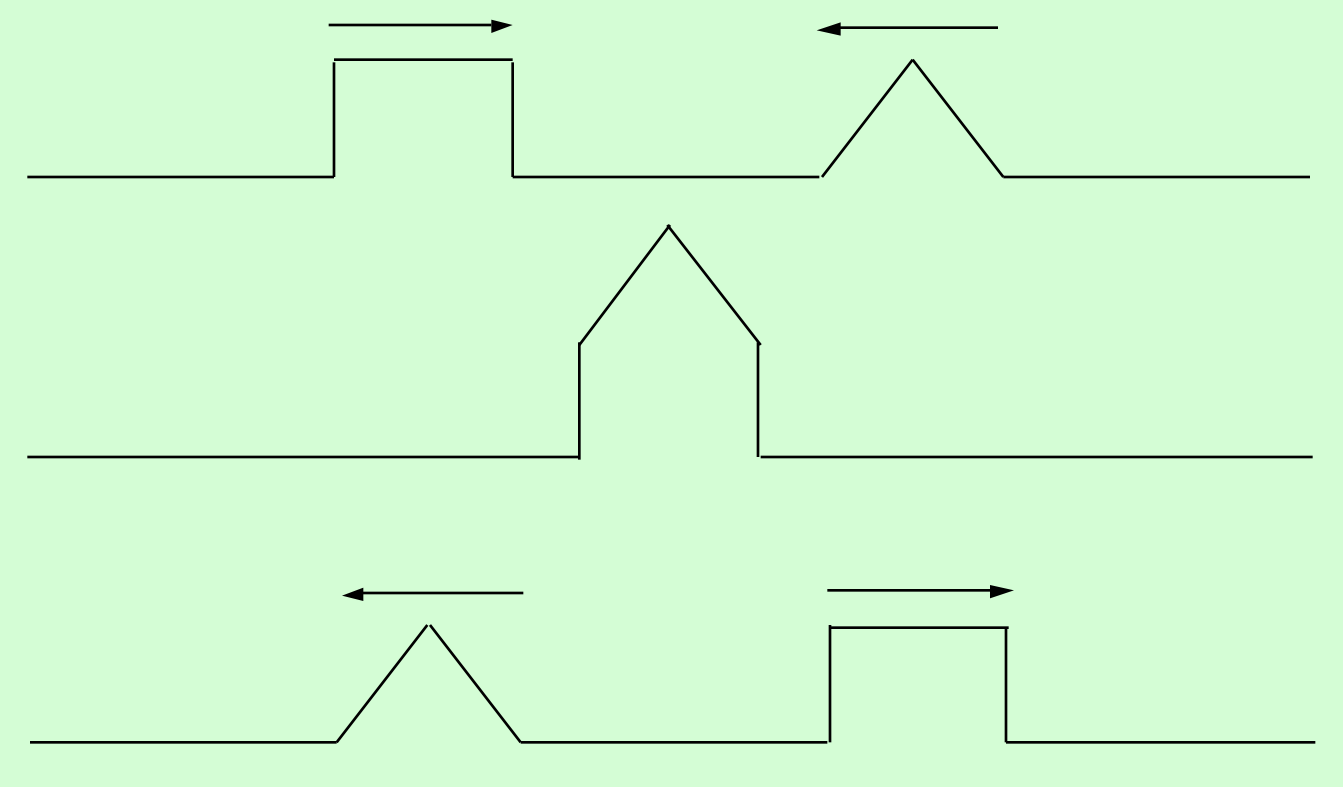

Figure 1.8: Wave superposition. Note in the middle drawing that the wave shape is simply the arithmetic sum of the amplitudes of each wave. Note also in the bottom drawing that the two waves have the same shape and amplitude as they had before encountering each other.

ACTIVITY

WAVE INTERFERENCE

In each of the following two cases, the wave pulses are moving toward each other. Assume that each wave pulse moves one graph grid for each new graph. Draw the shape the medium would have in each of the blank graphs below.