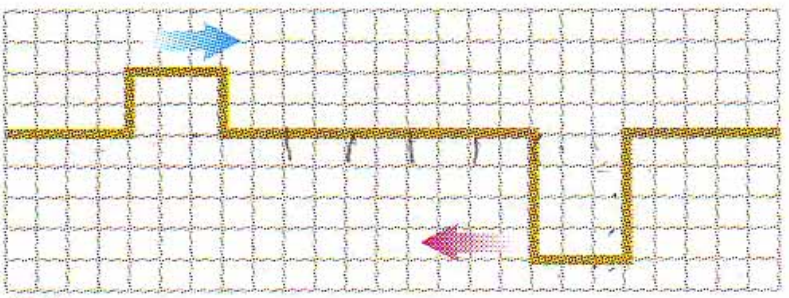
15. • In Figure 12.39, each pulse is traveling on a string at 1 cm/s, and each square represents 1 cm. Draw the shape of the string at the end of 6 s, 7 s, and 8 s.



(b)

▲ **FIGURE 12.39** Problem 15.

16. • A 1.50-m-long rope is stretched between two supports with a tension that makes the speed of transverse waves 48.0 m/s. What are the wavelength and frequency of (a) the fundamental tone? (b) the second overtone? (c) the fourth harmonic?

25. • The longest pipe found in most medium-size pipe organs is 4.88 m (16 ft) long. What is the frequency of the note corresponding to the fundamental mode if the pipe is (a) open at both ends, (b) open at one end and closed at the other?

30. •• **Singing in the shower!** We all sound like great singers in the shower, due to standing waves. Assume that your shower is 2.45 m (about 8 ft) tall and can be modeled as an organ pipe. (a) What will we have at the floor and ceiling, displacement nodes or antinodes? (b) What are the wavelength and frequency of the fundamental harmonic for standing waves in this shower? (See the answer to Problem 28.) (c) What are the wavelength and frequency of the first two overtones for this shower?