Section 8.2: Types of Mechanical Waves

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A. In the transverse wave demonstration, when we pass each other, we are still 1 m apart. If that is the *x*-axis, then in the *y*-axis I am always one step behind the person in front of me and one step ahead of the person behind me.

B. The farthest you could move was three steps. In a true medium, this aspect of the wave's motion would be controlled by the density of the medium and the size of the vibration.

C. In the longitudinal wave demonstration, it was difficult to maintain the motion because if we didn't all move at the same time, the people in front and behind me would get in my way.

D. Answers may vary. Sample answer:
The simulations were not fair because the particles did not all return to their equilibrium. Only the first person, fourth person, and so on, returned to their starting points.

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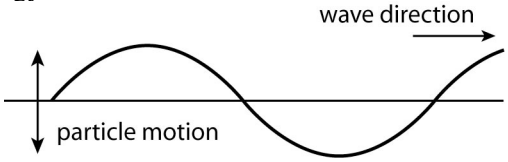
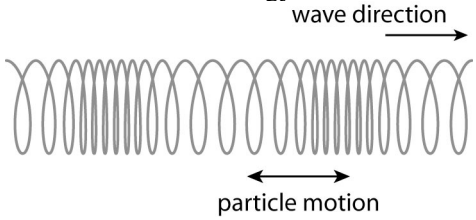
1. Answers may vary. Sample answer:
In transverse waves, particles of the medium move perpendicular to the direction of the flow of energy.



In longitudinal waves, particles move parallel to the direction of flow of energy.



2. Answers may vary. Sample answer:
A vibrating string and a boat in a sea. The string vibrates perpendicular to the direction of energy flow. Similarly, the boat moves up and down, whereas the water waves move perpendicularly to the boat.

3. Answers may vary. Sample answer:
Sound waves and shock waves are examples of longitudinal waves. In these waves, the disturbance travels along the same axis as the motion of the wave.

4. The "wave" is not a true mechanical wave because there is no equilibrium point in the motion. People raise their hands in only one direction. Also, there is no flow of energy, just a simulation to give the appearance of it.

5. Answers may vary. Sample answer:
Longitudinal waves that have properties making them detectable to the human ear are referred to as sound. The energy transferred through successive compressions and rarefactions of a sound wave causes vibrations in our ears that our brain interprets as sound. Sound is transmitted effectively in solids due to their tight molecular arrangement.

6. Yes. Sound is a mechanical wave because it is caused by vibrations of materials.

7. Answers may vary. Sample answer:
Advantages of being able to detect sound include medical uses such as stethoscopes, aesthetic pleasure through musical instruments, and animals detecting food or predators.

8. Answers may vary. Sample answer:
Two examples of complex wave motion are ocean waves and the waves that result when you strike a solid object. The water particles move up and down at the same time as they move back and forth. These are characteristics of longitudinal and transverse waves. When a solid object is struck, the impact creates transverses waves along the surface and longitudinal waves below the surface. In sound waves, the disturbance travels along the same axis as the motion of the wave.

9. Answers may vary. Sample answers:
(a) Sound reduces as the air is removed from the jar and increases as the air is pumped back into the jar.
(b) Sound waves require a medium to move through. As the air is removed from the jar, the density of the medium decreases so the sound decreases.