

# **Wave Speed and Tension**

#### **Background**

Before playing her violin, the musician must adjust the tension, or the amount of force pulling on each string, to tune the violin.

#### Question

How does the tension in a material affect the waves traveling through that material?

#### **Materials**

coiled-spring toy meterstick stopwatch

### **Objectives**

 Determine the relationship between tension and wave speed.

# Safety Precautions 🕿 🛂 踕

#### **Procedure**

- 1. Read the procedure and safety information, and complete the lab form.
- 2. Create a data table similar to the one shown.
- 3. Attach one end of the spring to a chair leg so that the spring rests on a smooth floor.
- 4. Stretch the spring to a length of 1.0 m.
- 5. Make a longitudinal wave by squeezing several coils together, and then releasing them.
- 6. Have your partner time how long the wave takes to travel two or three lengths of the spring. Record the time in your data table. Record the distance the wave traveled in your data table.
- 7. Repeat steps 4 and 5 two more times for waves 2 and 3.
- 8. Stretch the spring to a length of 1.5 m. Repeat steps 4 and 5 for waves 4, 5, and 6.

		Data Table		
	Distance (m) Wave T		Wave Speed (m/s)	
Wave 1				
Wave 2	11			
Wave 3				
Wave 4	_			
Wave 5				
Wave 6				

# LAB

(continued)

Conclude	and	Ap	ply
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•	Calculate the average speed of the waves on the spring when the spring has a length of 1.0 m.
	Calculate the average speed of the waves on the spring when the spring has a length of 1.5 m.
•	Describe how the tension in the spring changes as the length of the spring is increased.
•	Describe how the wave speed depends on the tension. How could you make the waves travel even faster? Test your prediction.
•	Predict how you could increase the speed of waves along a violin string.

## **Communicate Your Data -**

Compare your results with those of other students in your class. Form a hypothesis about what you might observe if the coiled-spring toy were made of another material. How would you test your hypothesis?