

**Forces in Fluids** ▪ *Design Your Own Lab*

# Spinning Sprinklers

**Problem**

What factors affect the speed of rotation of a lawn sprinkler?

**Skills Focus**

designing experiments, controlling variables

**Materials**

empty soda cans

fishing line, 30 cm

waterproof marker

wide-mouth jar or beaker

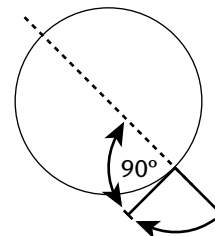
stopwatch or clock with second hand

nails of various sizes

large basin

**Procedure** **Part 1: Making a Sprinkler**

1. Fill the jar with enough water to completely cover a can. Place the jar in the basin.
2. Bend up the tab of a can and tie the end of a length of fishing line to it. **CAUTION:** *The edge of the can opening can be sharp.*
3. Place a mark on the can to help you keep track of how many times the can spins.
4. Using the small nail, make a hole in the side of the can about 1 cm up from the bottom. Poke the nail straight in. Then twist the nail until it makes a right angle with the radius of the can. See the diagram. **CAUTION:** *Nails are sharp and should be used only to puncture the cans.*



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5. Submerge the can in the jar and fill the can to the top with water.
6. Quickly lift the can with the fishing line so that it is 1–2 cm above the water level in the jar. Practice counting how many spins the can completes in 15 seconds.

**PART 2 What Factors Affect Spin?**

7. How does the size of the hole affect the number of spins made by the can? Propose a hypothesis and then design an experiment to test the hypothesis. Obtain your teacher’s approval before carrying out your experiment. Record all your data.
8. How does the number of holes affect the number of spins made by the can? Propose a hypothesis and then design an experiment to test the hypothesis. Obtain your teacher’s approval before carrying out your experiment. Record all your data.

**Data Table**

Nail Size	# of Holes	# of spins in 15 seconds
small	1	
small	2	
medium	1	
medium	2	
large	1	
large	2	

**Analyze and Conclude**

*Write your answers in the spaces provided.*

1. **Designing Experiments** How does the size of the hole affect the rate of spin of the can? How does the number of holes affect the rate of spin of the can?

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## Spinning Sprinklers *(continued)*

**2. Controlling Variables** What other variables might affect the number of spins made by the can?

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**3. Interpreting Data** Explain the motion of the can in terms of water pressure.

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**4. Classifying** Which of Newton's three laws could you use to explain the motion of the can? Explain.

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**5. Communicating** Use the results of your experiment to write a paragraph that explains why a spinning lawn sprinkler spins.

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### More to Explore

Some sprinkler systems use water pressure to spin. Examine one of these sprinklers to see the size, direction of spin, and number of holes. What would happen if you connected a second sprinkler to the first with a length of hose? If possible, try it.

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