



# Wind Can Do Work

Names: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Question

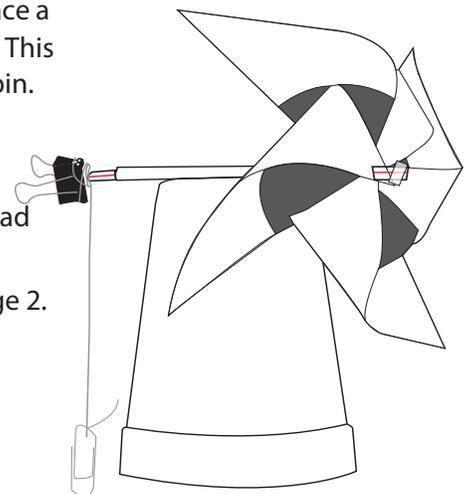
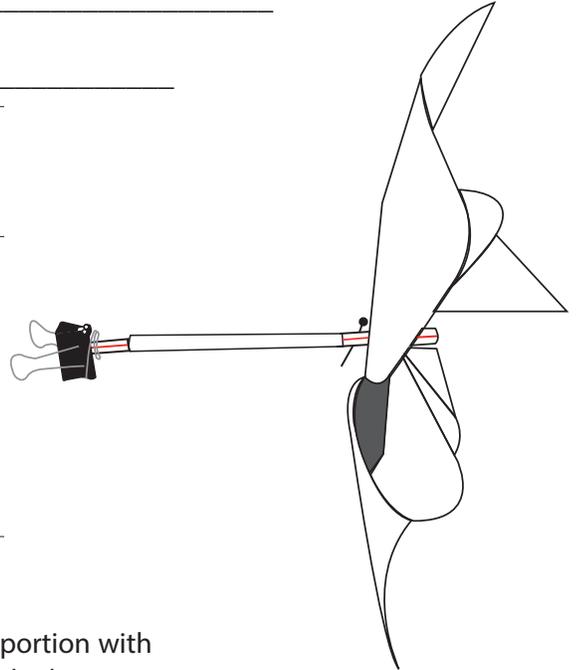
What is the maximum load that can be lifted all of the way to the top of the windmill shaft?

## Materials

- 4-Blade Windmill Template
- 1 large diameter straw
- 1 small diameter straw
- Masking tape
- 50 cm String or thread
- Paper clips
- Large foam cup
- 2 Straight pins
- Small binder clip
- Fan
- Ruler
- Hole punch
- Marker
- Scissors

## Procedure

1. Turn the cup upside down.
2. Cut the larger straw so that you have an 8 cm length. Share the other portion with another student or group, or discard it. Tape this straw horizontally to the bottom of the cup (which is now the top) so that there is an equal amount of straw on both ends. Set this aside.
3. Prepare the windmill blades using the *4-Blade Windmill Template* (page 3).
4. Slide the small straw through the center of the windmill blades and fold over the tips of the blades. Secure the blades to the front of the straw using tape.
5. Use a pin or piece of tape behind the blades to hold them in place.
6. Insert the small straw into the larger straw on the cup.
7. Tape the string to the end of the small straw. Tie the other end of the string to a paper clip. Make sure you have 30 cm of string from the straw to the top of the paper clip.
8. On the very end of the small straw near where the string is attached, fasten a binder clip in place for balance and to keep the string winding around the straw.
9. Slide the small straw forward to bring the binder clip next to the larger straw. Place a second straight pin through the small straw at the other end of the larger straw. This will keep the blades away from the cup while still allowing them to move and spin.
10. Place your windmill in front of the fan and observe. Record observations in your science notebooks.
11. Investigate: Keep adding paper clips one at a time to determine the maximum load that can be lifted all of the way to the top. Record your data on page 2.
12. Change a variable or improve your windmill and retest. Record your data on page 2.
13. Keep working and retesting to get the maximum number of paperclips.



 **Notes**

\_\_\_\_\_ energy converts \_\_\_\_\_ to another form of energy like \_\_\_\_\_ or \_\_\_\_\_.

Windmills convert wind to \_\_\_\_\_ energy.

Wind turbines convert wind to \_\_\_\_\_ energy.

 **Hypothesis**

I predict that \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

 **Data**

Trial	Max # of paper clips lifted	Variable(s) changed

 **Conclusion**

How could you change the design of your windmill to produce more work from the system?

\_\_\_\_\_  
\_\_\_\_\_

What variables can you change in this investigation?

\_\_\_\_\_  
\_\_\_\_\_

Describe another possible investigation/experiment.

\_\_\_\_\_  
\_\_\_\_\_



# 4-Blade Windmill Template

## ✓ Procedure

1. Cut out the square.
2. Cut on the dotted, diagonal lines.
3. Punch out the four black holes along the sides (being careful to not rip the edges) and the one in the center.
4. Follow the directions on the *Wind Can Do Work* worksheet to complete the windmill.

