

# Measuring the Wind Instruction Guide

Name(s) \_\_\_\_\_ Date \_\_\_\_\_

## MATERIALS

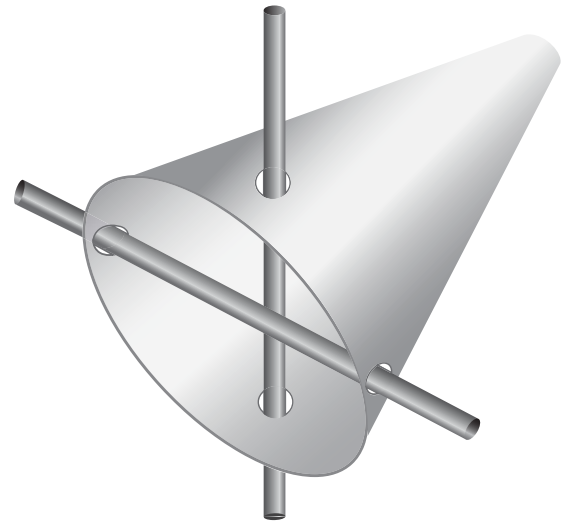
- 1 pencil
- 5 snow cone cups
- 2 extra-long plastic straws
- Masking tape
- Single hole punch
- Scissors
- 1 straight pin
- Marker
- Stopwatch or a watch with a second hand
- Ruler

## PROCEDURE

### CONSTRUCT YOUR ANEMOMETER<sup>1</sup>

1. Read through all the steps in the procedure first, and ask your teacher about anything you do not understand.
2. Use the marker to entirely color one of your snow cone cups, inside and out.
  - This will help you count the rotations (number of spins) of the anemometer later.
3. Pick up another (white) cone. Cut a tiny bit off the tip to make a just hole large enough for the pencil to slide in.
  - This will be your “base cup,” which will hold the anemometer arms together on the pencil.
4. Use the hole punch to make four holes around the larger side of the base cup:
  - Two holes opposite each other close to the rim, but not on it!
  - Two holes between the first two holes, about  $\frac{1}{2}$  centimeter farther away from the the rim of the cup.
5. Slide the straws through the holes in the base cup, making an “X” (see Figure 1).
6. Center the straws in the base cup, so you have the same length sticking out on all four sides.
  - Use a ruler to make sure that the same amount of straw is sticking out on each side.

Figure SEQ 1: Base Cup

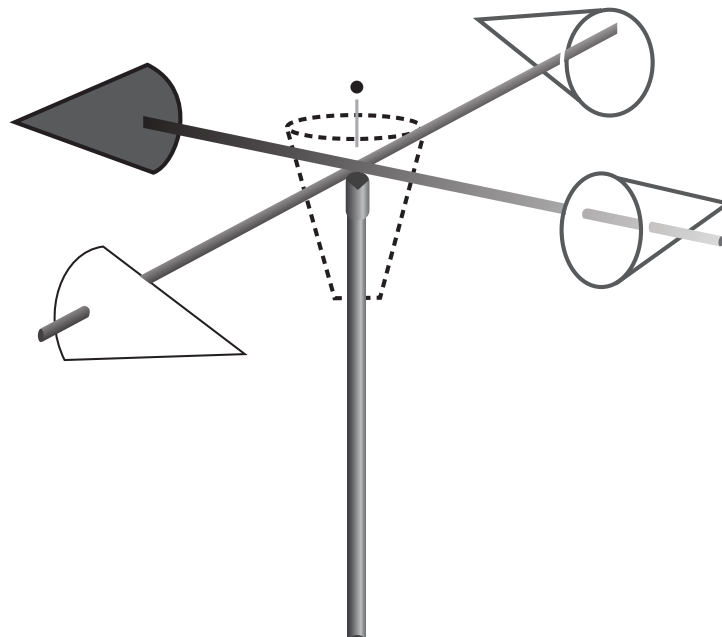


7. Slide the base cup over the pencil through the hole in the tip of the cone.
8. Push the pin through the middle of both straws and into the pencil eraser – as far as you can – to anchor the device.
9. On the four remaining cups, including the one you colored, use the hole punch to make two opposite holes in each cup, about 1 centimeter below the rim of each cup..
10. Slide one cup onto the end of each straw. Make sure that all the cups face the same direction (See Figure 2).
11. Adjust the cups on the straws so that they are all spaced equally and balanced. Check by letting them go and see if one side dips down. If it does, adjust the cups.
12. Once the cups are balanced on the straws, tape the cups to the straws.
13. Lift the straws slightly away from the eraser on the pin, so that the device spins easily.
  - You might need to stretch the pin holes in the straws by pulling gently on the straws while holding the pin in place.
14. Test your anemometer by holding it upright and blowing into one of the cups. If the cups spin freely, great job! If not, adjust the pin and straws as described in step 11 until the cups spin freely when you blow.

### WORK CHECKLIST

Steps	✓
1. I have all of my supplies.	
2. I colored one of my five cups.	
3. I cut the tip of the “base” cup off, and slid the pencil through it.	
4. I punched four holes to make an X in the “base” cup, and crossed the straws.	
5. I punched two holes in each of the four other cups, so the holes went across from one side to the other.	
6. I put the four cups on the ends of the two straws.	
7. I made sure all the cups are facing the same direction.	
8. I centered the straws and cups, so all the cups are spaced equally.	
9. I pushed the pin through the spot where the two straws cross, and into the pencil eraser.	

Figure 2: Completed Anemometer



## MEASURING THE WIND

We can calculate wind speed by counting the number of rotations the anemometer makes in 10 seconds. That is, we count the number of times the anemometer makes one complete spin in 10 seconds.

1. Bring your anemometer, stopwatch, and Instruction Guide (this document) to your outside location.
2. Assign one person to hold the anemometer (the Holder), one to work the stopwatch (the Timer), and one to record the data (the Recorder). If you are working in a group of two, you can share roles.
3. Decide which group member or members will count the rotations (the Counters).
4. [Holder] Hold the anemometer upright and straight.
5. [Timer] Set the stopwatch to 10 seconds.
6. [Timer] Press the stopwatch button at the same time that you say “go” aloud.
7. [Counter(s)] Count the number of times the colored anemometer cup makes one full rotation (spins completely around the pencil) until the stopwatch beeps or the person holding it says “stop.”
8. [Timer] At exactly 10 seconds, say “stop.”
9. [Recorder] In Table 2 on page 4, write the number of rotations that each Counter counted during the 10 seconds. If more than one group member counted, record each person’s count on a separate line as a separate trial.
10. Repeat steps 2–9 each time you measure the wind speed. Make sure you get at least 3 measurements for each location you test.

## AVERAGE YOUR COUNTS AND FIND THE WIND SPEED

11. Calculate the sum of the number of rotations for each location and write it in Table 2, Row A.
12. Write the number of completed trials (the number of rows you filled out) for each location and write it in Table 2, Row B.
13. Calculate the average number of rotations for each location using the method shown in Table 2, Row C (or the method your teacher shows you) and write it down.
14. Find that number of rotations in Table 1, and convert it to a wind speed.
  - For example, if you counted 11 rotations, you would record a wind speed of 4 mph.
  - Record the wind speed in Table 2, Row D.
15. Look up your average rotations in Table 1, and compare your average speed to the average speed listed in the table. Are they the same?
16. Compare your results with those of other students in the class.

**Table 1. Anemometer Speed Conversion**

Rotations per 10 Seconds	Wind Speed (mph)
2 - 4	1
5 - 7	2
8 - 9	3
10 - 12	4
13 - 15	5
16 - 18	6
19 - 21	7
22 - 23	8
24 - 26	9
27 - 29	10
30 - 32	11
33 - 35	12
36 - 37	13
38 - 40	14
41 - 43	15
44 - 46	16
47 - 49	17
50 - 51	18
52 - 54	19
55 - 57	20

**Table 2. My Team's Data Collection Sheet**

Location:				
Trial	# Rotations	# Rotations	# Rotations	# Rotations
1				
2				
3				
4				
Sum of Completed Trials				
Number of Completed Trials				
$A \div B = C$ (or most common #) = Average # of Rotations				
Average Wind Speed				

**Table 3. Class Data**

Location	Average Rotations	Average Wind Speed
<b>Class Averages</b>		