

Investigation 1

How windy is it? Make an anemometer to measure the wind

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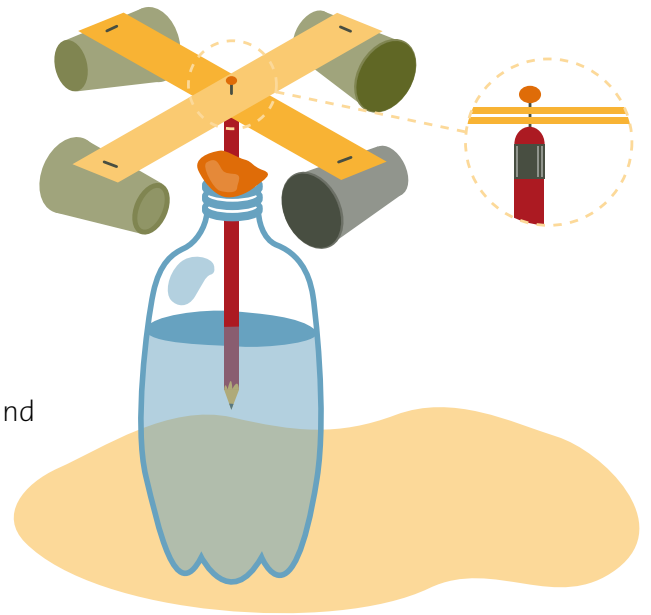
Task: *Make an anemometer to measure the wind.*

Wind turbines need an average wind speed of more than 14 kilometres per hour to generate electricity.

You can make a simple meter to measure the wind speed wherever you are. A wind meter is called an anemometer.

What you need

- Four small drinking cups
- Two strips of stiff cardboard – 40 cm X 4 cm
- Stapler
- Push pin
- Bottle (plastic is best) $\frac{3}{4}$ filled with water
- Pencil with eraser tip
- Coloured marker
- Modelling clay or plasticine (4 cm ball)
- Watch / clock with second counter or second hand
- Plasticine



Build your anemometer

Step 1

Colour-in any colour the outside of one cup.

Step 2

Cross the cardboard strips so they make a plus sign – make sure the arms are exactly equal in length.

Step 3

Find and mark the exact centre of the cardboard cross.

Step 4

Staple the cups to the end of the cardboard strips – so the cups are all facing in the same direction.

Step 5

Push the pin through the centre of the cardboard and then into the rubber eraser tip (so the pencil hangs down at right angles); don't press the pin down tightly so the rotors can spin easily.

Step 6

Put a pencil in the bottle so that the rubber tip and cardboard rotors are 1 cm above the lip.

Step 7

Pack the plasticine around the pencil to hold it in place.

Step 8

Spin the rotors around a few times to make sure it spins freely.

Use your anemometer to collect wind data

Using the clock / watch, count the number of times the marked cup spins around in one minute. It will be more fun and easier if you do this with a friend so one can count while the other watches the clock.

[If you are having trouble counting for one minute, try counting for half a minute and then double your count.]

The number of rotations measures the wind speed in revolutions per minute.

The weather bureau uses anemometers that convert the revolutions per minute into kilometres per hour (kph).

Record the wind speed at different times of the day over several days. Choose an open area to make a wind speed reading. Then move to a more protected area and see what difference location can make.

If your cardboard strips are exactly 40 cm long, about 185 rotations per minute equals 14 kph.

Were any of your wind speed readings higher than 14 kph?

Longer rotors – do the maths!

If the cardboard rotors are longer or shorter than 40 cm you need to do your own calculations to convert the rotations into kph.

How many rotations per minute equals a wind speed of 14 kph?

1. Calculate the circumference of your anemometer.

Circumference (metres) = $3.14 \times$ diameter (length of rotor metres from tip to tip).

2. How many metres per minute is 14 kph?

14 kph = 14,000 metres per hour = 233.33 metres per minute.

3. How many rotations of your anemometer in one minute are equal to 14 kph?

$233.33 \div$ circumference of your anemometer (metres) = rotations per minute equal to 14 kph.

14 kph = $233.33 \div (3.14 \times$ length of rotor in metres)