



### Constructing

Students make paper windmills - one of the simplest devices for measuring the strength of the wind.

#### Materials:

- scissors - (1/person)
- an A4 (letter size) sheet of paper (1/person)
- a thumb tack (1/person)
- a wooden pencil or skewer (1/person)
- a color marker pen

#### Instructions:



Help your students, but don't make the windmills for them. Allow them to look for an effective method on their own. If a student knows how to make one, (s)he can teach his/her friends.

1. Lay the piece of paper horizontally on a flat surface, and then fold it diagonally in order to create a triangle (see Photograph 1).
2. Very carefully, cut off the rectangular strip left at the end, and then unfold the triangle, leaving a square.
3. Now fold the square diagonally, thereby joining the two opposite corners. Unfold the sheet and do the same along the other diagonal. After unfolding, the creases on the paper should form an "x" with its center in the middle of the square (Photograph 2).
4. Use the scissors to cut along the creases from the corners of the square to halfway along their length (Photograph 3). Now, taking great care not to cut yourself on the paper, grasp the 4 alternate corners and pull them to the center of the square. Push the thumb tack through each corner and then through the center of the square (Photograph 4).
5. Draw a bright dot with the marker pen on one of the sails, (Photograph 5).
6. Push the thumb tack together with the finished windmill into the side of a wooden pencil or stick (Photograph 5).



### Constructing

Make a cup and plate anemometer in order to learn what more complicated devices for measuring wind strength look like and how they work.

Two groups of students will make a cup wind meter, while the two other groups will make a deflection wind meter.



Help the students whenever necessary. Make sure that everyone is involved in the work of the team and that everyone carries out some part of the task. Suggest to them that they divide up the roles effectively and choose a leader for their group. The leader will be responsible for supervising the construction of the device and coordinating all the activities.

### Instructions for building a cup anemometer

Materials needed :

- cardboard
- scissors
- paper cups (4 items) or ping pong balls (2 items) or chocolate egg (plastic shell) packaging (4 items)
- a pin or needle
- a short pencil with eraser
- a thread spool (may be empty) or plastic medicine bottle
- a wooden board or cardboard measuring 4 in x 4 in (10 cm x 10 cm)
- universal glue
- plasticine

The materials listed above are sufficient to prepare one model wind meter. If you want, one group can make more models – in which case prepare more sets of materials.

1. Attach the spool or plastic medicine bottle to the cardboard or wooden board using glue or plasticine.
2. If you are using cardboard, weigh it down heavily with plasticine.
3. Cut two strips measuring 1.5 in x 12 in (4 x 30 cm) from the cardboard (photograph 1).
4. In the middle of each strip, make an incision approximately half way along it. Then interlock the two strips so as to form a cross (photograph 2).
5. If you are using ping pong balls, cut them in half – if you are using cups, cut off their top part so that they are shorter (photograph 3), then glue the bottoms to the ends of the paper cross (photograph 4). If you are using chocolate egg (plastic shell) packagi, take half and glue the bottom part onto each of the ends of the paper cross.
6. Push a pin into the center of the cross, and then drive it into the pencil eraser.
7. Insert the pencil in the spool or the plastic medicine bottle. Secure it with plasticine so that it doesn't move.
8. The cup anemometer is ready.

If, in spite of a noticeable wind, the cross doesn't rotate, you should make a bigger hole in the center of the cross.

### Instructions for making a deflection anemometer

Materials:

- cardboard
- two wooden kebab skewers
- a sheet of paper
- plasticine
- adhesive tape
- a protractor
- scissors
- two 1.5 liter plastic bottles

1. Cut a rectangle measuring 4 in x 4 in (10 cm x 10 cm) out of the cardboard
2. Attach the end of the skewer to the center of the cardboard using adhesive tape so as to form a sort of paddle (photograph 6).

3. Attach the end of the skewer-cardboard "paddle" to the center of the second skewer using plasticine or adhesive tape. The two glued skewers should be glued "rigid" and be perpendicular to each other (photograph 7).
4. Make one hole in each bottle. The holes should be made at the same height in both bottles and be located quite high near the neck.
5. Pour a bit of water into the bottles so that they are heavy and stable.
6. Place the bottles with their openings facing each other so that the distance between them is about 6 in (15 cm).
7. Insert the free ends of the stick into the holes in the bottles so that the cardboard can hang and swing freely (photograph 8).
8. At the end of the experiment you can make a scale on a sheet of paper using the protractor, which will indicate how much the cardboard has swung. Attach the sheet with the scale to one of the bottles (photograph 9).
9. The deflection wind meter is ready.

**After constructing the anemometers, ask the groups to present their results and test their devices to see how they work.**

In order to measure the strength of the wind using a cup anemometer, place the device in the wind. The cups, ping pong balls or chocolate egg (plastic shell) packaging will catch the wind and cause the device to start to turn under its influence. The greater the wind speed, the faster the device will rotate.