



Curiosity Guide #301

Wheel and Axle

Accompanies Curious Crew, Season 3, Episode 1 (#301)

Pinwheel Power

Investigation #5

Description

Make a pinwheel that can do work!

Materials

- Paper
- Ruler
- Pencil
- Metal washer
- Scissors
- Paper punch
- Straw
- Clay
- String or twine
- Paper clip
- Tape

Procedure

- 1) Measure and cut a piece of paper into a 6-inch square.
- 2) Use a ruler to connect the diagonal corners of the paper. With a pencil, draw a line from corner to opposite corner. Repeat with the other two opposite corners. It will look like an X on the square paper.
- 3) Center the small metal washer in the middle of the drawn X and trace the outside circle with the pencil.

- 4) Use the paper punch to punch a hole in the bottom right corner of the paper. The hole should be $\frac{1}{2}$ inch above the line and $\frac{1}{2}$ inch in from the edge.
- 5) Rotate the paper and repeat step 4 in each of the corners.
- 6) Use the point of the pencil to poke a hole in the very center of the paper.
- 7) Use the scissors to cut along each line toward the center, stopping at the circular pencil line you drew when you traced around the washer.
- 8) Start in one corner. Carefully fold the corner flap toward the center, lining up the punched holes with the center hole. Repeat with the other corners, moving around the paper to the next flap, and then the next, until all are folded to the center.
- 9) Insert the straw through the holes and slide the pinwheel so it is centered on the straw.
- 10) Break off two small pieces of clay. Form the clay on either side of the pinwheel so that the clay goes around the straw and holds the pinwheel snugly in place.
- 11) Cut a 2-foot length piece of string.
- 12) Loop one end of the string around one leg of the straw. Center the loop between the pinwheel and the end of the straw, and tape it in place.
- 13) Tie the other end of the string around a paper clip.
- 14) Place the pinwheel in your hands so that each end of the straw is supported on the edge of your hands between your thumbs and index fingers.
- 15) Hold the pinwheel in front of you and blow.
- 16) Does your pinwheel rotate?
- 17) Can your pinwheel wind up the paperclip?

My Results

Explanation

Work is when a force is applied to an object over a certain distance. The math formula is $W = F \times D$. Any time something is being moved, or pushed, or pulled, you are doing work. When you make a pinwheel, the paper acts as the wheel, and the straw acts as the axle. When you blow on the pinwheel, the pinwheel can begin to rotate and hoist the paperclip. Laying the pinwheel on the edge of your hand reduces the amount of friction so the pinwheel can rotate more freely.

Try this! What would happen if you used a bigger sheet of paper? Would the sails of the pinwheel be able to do more work?

Connect your learning: Follow with *Waterwheel Work*, 301-6. This activity was also done in the previous season.

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