

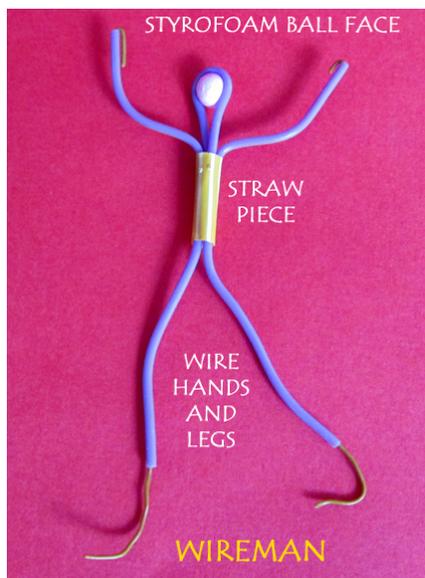


<http://www.arvindguptatoys.com/toys/Rubanddance.html>

How To:

Part 1: Create a line of staples on the paper cup

1. Place a dozen staples in a line on the side of the cup from bottom to top, ensuring that they are equidistant from one another and run perpendicular to the vertical line on the cup.
2. Staple so the straight edge of the staple is on the outside of the cup.



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Part 2: Assemble the wireman

1. Using a pair of scissors, cut two 12 cm pieces and one 6 cm piece of wire.
2. Slide both of the 12 cm pieces of wire through the ½ inch long straw piece. Position two wires above the straw to generate arms and two pieces below to form the legs.
3. Be sure that the wire below the straw for the two legs is slightly longer than the wire above the straw for the two arms.

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4. To create the head, take the 6 cm piece of wire and bend it in half, wedging the Styrofoam ball into the crease of the wire.
5. Secure the head and neck portion of the wireman by placing both ends of the 6 cm piece of wire into the straw body.

Part 3: Secure the wireman onto the paper cup

1. Create a 5 cm diameter circle using the 12 cm long pipe cleaner by bending and tying the ends of the pipe cleaner together.
2. Once the pipe cleaner ring has been formed, secure the wireman onto the pipe cleaner by laying the ring flat on the table and twisting the ends of the feet around the ring.

Part 4: Watch the wireman dance!

1. Place the wireman that is secured onto the pipe cleaner ring on top of the upside down paper cup.
2. While holding the very bottom rim of the upside down cup with the wireman on top, use a fingernail or ballpoint pen refill to rub the line of staples up and down. What happens?
3. Observe as the wireman dances in response to the vibrations.

STEM Explanation:

All things wiggle, meaning they move back and forth. Objects can move in a variety of different ways, so it's important to study the science behind these movements, also called vibrations. Much of what we observe and experience in our physical world is due to vibrations and waves. Vibrations of an object occur when a force acts on an object to restore it to its original resting position after it has been displaced. In the wireman example, the staples are displaced from their original position when a fingernail or pen is rubbed along the line of staples. The resulting vibrations are what cause the wireman to move and dance. Once it returns to the resting position, the vibrations will stop and the object is said to have returned to equilibrium, which is when all forces are balanced. The staples will remain in equilibrium until a force, such as the rubbing with a fingernail or pen, acts upon the staples to displace it once again.

Career Connection:

Acoustical engineers deal with sound and vibrations. Their main concerns are focused around how they can manipulate, analyze, and control sound. In the field of acoustical engineering, professionals can work in fields such as architectural acoustics as well as noise or vibration control. These professionals can be found working in a multitude of places and fields, such as in health care to develop ultrasound technology, in the music industry to develop sound synthesizers, or even in large concert halls to maximize sound.

Resources:

<http://www.arvindguptatoys.com/toys/Rubanddance.html>

<http://www.physicsclassroom.com/class/waves/Lesson-0/Vibrational-Motion>

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