

Activity: Tug-Push-Twist-O'War

How tough is this stuff?

Have you ever seen a paper skyscraper? Probably not, because paper is not strong enough to withstand the forces acting on a skyscraper. Hold a "tug-push-twist-o'war" to find out which materials can best withstand different forces.

What You Need

Three samples each of 6 or 8 materials, such as yarn, popsicle sticks, pipe cleaners, clay, sponges, erasers, rubber bands, paper-towel tubes, pencils, cardboard, aluminum foil, drinking straws, tiles, or cloth

Make a Prediction

Before you test the materials, predict which ones will be strongest in tension, which in compression, and which in torsion.

Try It Out

1. First make a table to record your results. You'll rate each material for each type of stress.

Material	Tension Rating	Compression Rating	Torsion Rating
Paper	2 (when we pulled slowly)	1	1

2. Tug: To test the material in tension, pull on it from both ends. Record your rating and any observations in the table.

3. Push: To test the material in compression, push it together from both ends. Record your rating and any observations.

4. Twist: To test the material in torsion, twist the two ends in different directions. Record your rating and any observations.

5. Repeat Steps 2-4 for each material.



Rating Scale

1	Very weak! It crumples or breaks with hardly any force.
2	Only fair—it can't withstand much force.
3	Pretty good—it takes a lot of force to break it.
4	Super strong! We can't break it.

Explain It

Which materials were strongest in resisting each type of force? Did any of these results surprise you?

Why or why not?

Which materials were strongest across all three tests? How would you describe those materials?

Build on It

Does shape affect how well a material performs in the Tug-Push-Twist-O'War? Choose a material and design a test to answer this question.