Build a Vertical Jumping Machine
Make a machine that can jump up more than 3 feet.

Background Inspiration

Biomechanics is the study of movement in living things! Biomechanics can answer questions like why does a cat always land on its feet when it falls or how do your muscles allow you to jump in a game of basketball. Biomechanics helps us understand how muscles make forces that help us move our bodies. If you break down the word: “bio” means life and “mechanics” is the field of physics dealing with forces causing motion but before we start exploring how things jump we need to learn a few key concepts.

What is a Force?
Draw a picture

What are some forces that you interact with everyday?

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Why are forces important in biomechanics?

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Elasticity and Tension
Draw a picture

What is the difference between elasticity and tension?

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Kinetic Energy and Potential Energy
Draw a picture

What is the difference between potential energy and kinetic energy?

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Draw a design you can build! Label the design parts and what materials you’ll use. Be creative!

Materials

- Rubber Bands of different sizes and strengths
- Cups of different sizes
- Meterstick or yardstick
- Hole puncher
- Tape
Track your results
Note your testing results

Tips to Build and Test Your Design

❖ Make sure you have a solid base to test on, tape a cup down to a table.
❖ When you are building, make sure to keep track of your different designs so you can see which ones work better
❖ Push the testing cup all the way down to the base of the cup
❖ Try to pull down the cup the same way every time you test to have the best results
❖ When you let go of the cup, move your hands away as quickly as possible
❖ Set up a yardstick and mark the height of each test
❖ Choose the cup with the least number of rubber bands to test first. Take a few times and take the best result.
❖ Test the second cup or add additional rubber cups to the first cup.

Reflect on Your Design!

What did you learn from this design challenge?

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How could you redesign your cup to make it jump higher?

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