

Build a Vertical Jumping Machine

Make a machine that can jump up more than 3 feet.

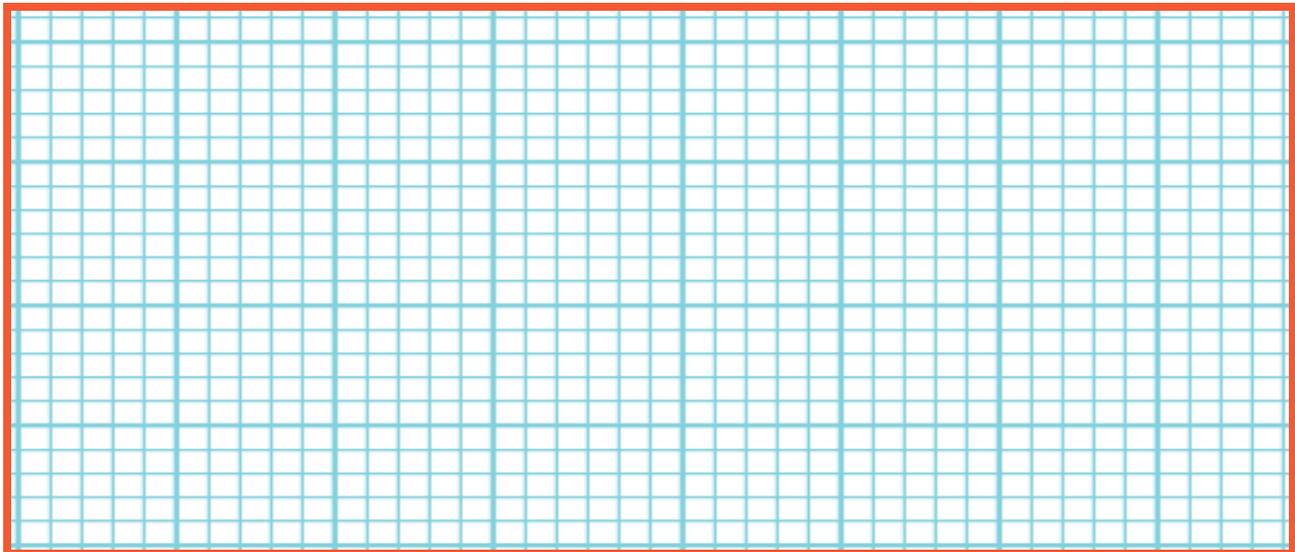


Background Inspiration

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

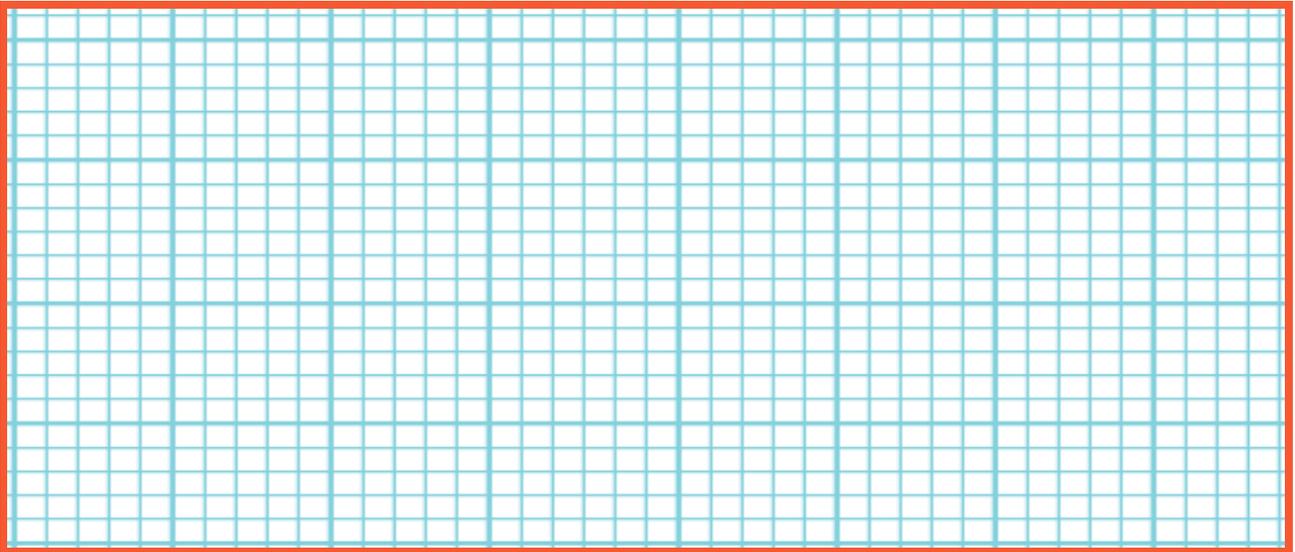


What are some forces that you interact with everyday?

Why are forces important in biomechanics?

Elasticity and Tension

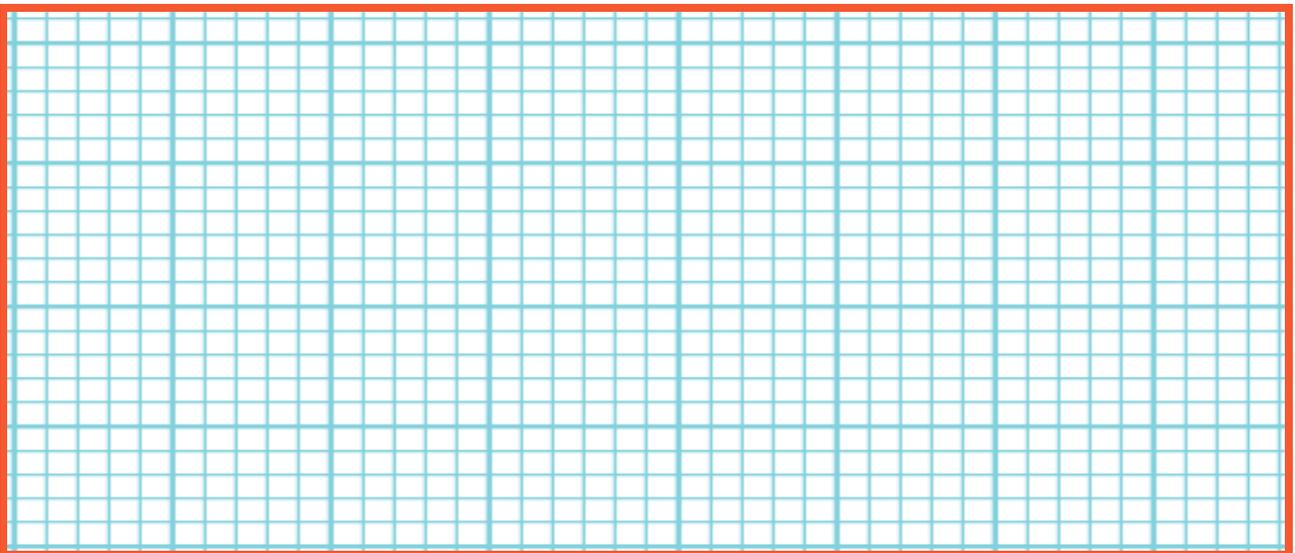
Draw a picture



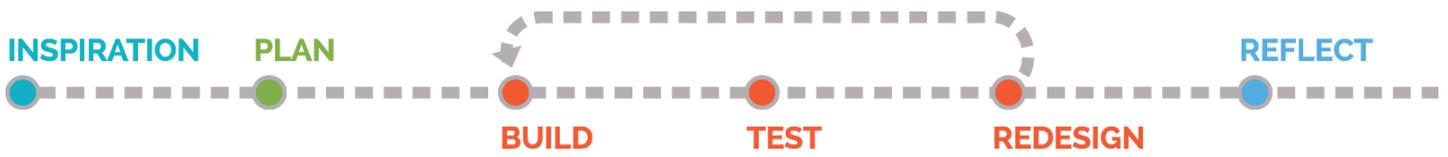
What is the difference between elasticity and tension?

Kinetic Energy and Potential Energy

Draw a picture

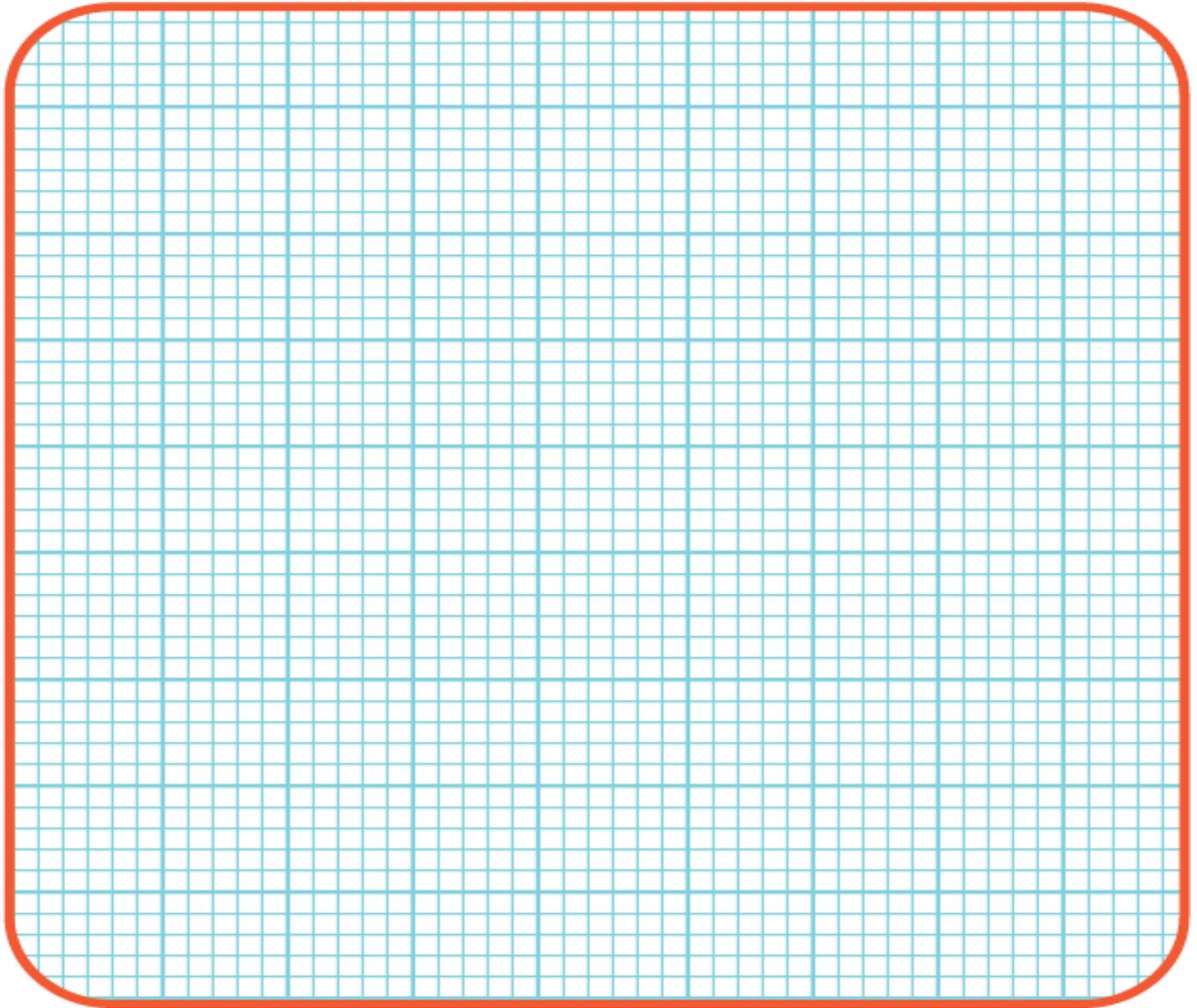


What is the difference between potential energy and kinetic energy?



Draw your Design

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

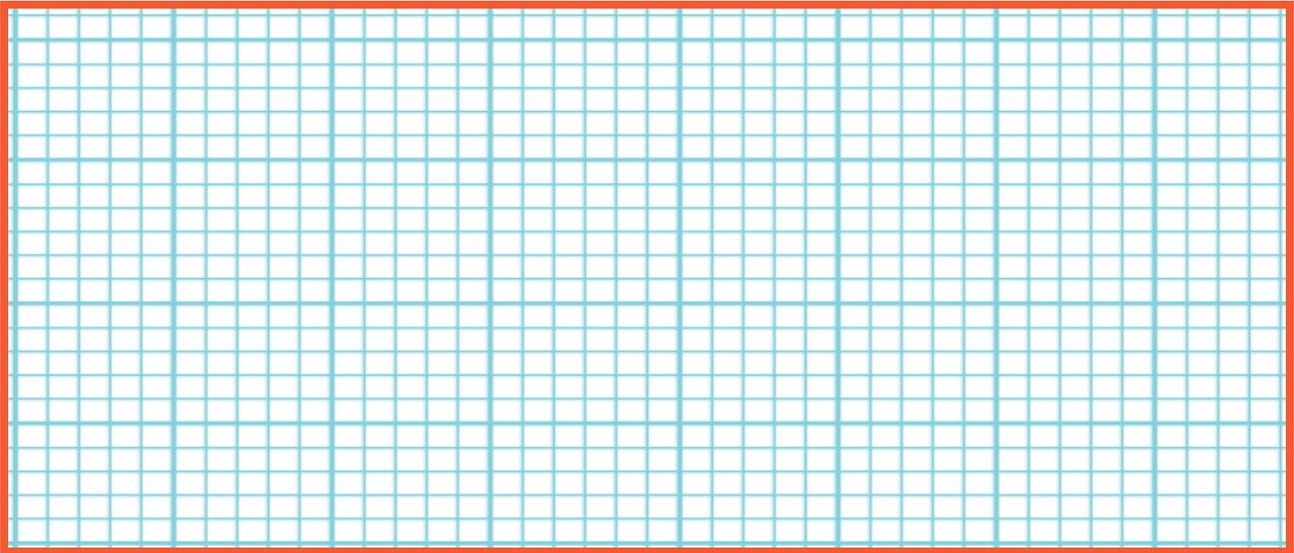


Materials

- ❖ 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?

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