

CATAPULT CHALLENGE

THE ENERGY OF A CATAPULT

A catapult works because **energy**, the ability to do work or make something move, can transfer from one object to another. **Trajectory** is the path a free-flying object (a **projectile**) follows through the air.

Energy falls into two main groups: **potential** energy and **kinetic** energy. **Potential energy** is energy that is stored, or not yet used, while **kinetic energy** is the energy that an object possesses due to its motion. Stretch a rubber band back with your fingers. Before you let it go, that energy is **potential**, but once you let it go, the energy is **kinetic**.

When you prepare the catapult to launch, you add energy to it by swinging the arm back. This energy is stored in the launching device as potential energy. The catapult uses elastic potential energy stored in the wooden arm as you bend it and rubber bands as you stretch them. When you let go, this stored energy is released and converted into kinetic energy. This energy transfers to the projectile, which forces it into the air.

The position of the catapult is an important parameter of aiming. Test your catapult to see how moving its position effects the trajectory of the projectile. What happens if you add or remove rubber bands? Can you increase and decrease its elastic potential energy and change the amount of energy that is transferred? What size projectiles travel the furthest? Experiment with various positions of the catapult, number of rubber bands, and types of projectiles.

Now that you have learned about energy and your catapult, do you have what it takes to hit a target? Try out these activities to find out!

READY, AIM, LAUNCH!

Materials needed:

- Catapult
- Paper target
- Markers or crayons
- Clay or various projectiles

1. Assemble the catapult according to the provided directions.
2. Use provided clay to form five small balls, the size of a small marble. You can also use various objects around your house that are small. These will be your projectiles.
3. Using the bullseye, assign each ring a number of points. Consider making the numbers harder or easier depending on your age to practice addition skills! Place the bullseye on the floor in an open area, preferably outside.
4. Take each projectile and place it on the catapult. Launch each object, aiming for the bullseye.
5. Record how many points you earn on each launch on your data recording sheet.
6. At the end of each round, add up your points. Each round consists of 5 launches.

****Remember:** always use caution when performing a scientific experiment. You should never launch a projectile at another person!

QUESTIONS TO CONSIDER

Experiment with projectiles that are different sizes. Which objects go farther? Which ones are more accurate?

What can you add to your catapult to make it perform differently?

CARNIVAL CATAPULT!

Materials needed:

- Catapult
 - STEAM in a box cardboard box
 - Scissors or Exacto knife
 - Markers or crayons
 - Clay or various projectiles
 - Timer
 - Number of players: As many as you'd like, just take turns!
1. Using an empty cardboard box (you can use your STEAM Activity Box), draw circles of different sizes on one of the large sides. You can use different sized cups as a stencil.
 2. Cut out your circles with scissors or an Exacto knife (you may need an adult to help you for this part)
 3. Assign points to each hole. Smaller holes should be worth more points because they are harder to hit!
 4. Set up your box with the holes facing you. It's a good idea to set up in front of a wall so you don't lose your projectiles but be sure to leave enough space for them to travel through the holes.
 5. Set up your catapult in front of the open box and gather different projectiles. Have each player use the same projectiles for an even match, or let each player choose their own to see which work best.
 6. Now the carnival game begins! You have 30 seconds to launch as many projectiles as possible through the holes. Add up your points at the end of the 30 second round and record them on the score sheet. After 5 rounds, see who scored the most points overall!

READY, AIM LAUNCH: DATA RECORDING SHEET

Projectile: Clay Balls

	Launch 1	Launch 2	Launch 3	Launch 4	Launch 5	Total
Round 1						
Round 2						
Round 3						

Projectile:

	Launch 1	Launch 2	Launch 3	Launch 4	Launch 5	Total
Round 1						
Round 2						
Round 3						

Projectile:

	Launch 1	Launch 2	Launch 3	Launch 4	Launch 5	Total
Round 1						
Round 2						
Round 3						

Projectile:

	Launch 1	Launch 2	Launch 3	Launch 4	Launch 5	Total
Round 1						
Round 2						
Round 3						

CARNIVAL CATAPULT: SCORE SHEET

	Round 1	Round 2	Round 3	Round 4	Round 5	Total
Player 1						
Player 2						
Player 3						
Player 4						

	Round 1	Round 2	Round 3	Round 4	Round 5	Total
Player 1						
Player 2						
Player 3						
Player 4						

	Round 1	Round 2	Round 3	Round 4	Round 5	Total
Player 1						
Player 2						
Player 3						
Player 4						