

# RAFT IDEAS

**Topics:** Motion and Forces, Potential and Kinetic Energy

## Materials List

- ✓ Staple remover, claw type
- ✓ CD case, wood block or equal
- ✓ CD media trays, 5 or more
- ✓ Plastic spoon, heavyweight (stiff)
- ✓ Safe objects to use as projectiles such as balled up aluminum foil, foam piece, cotton ball, or pom-poms
- ✓ Hot glue, other adhesive, and/or fasteners such as rubber bands, tape, or zip ties
- ✓ Pliers
- ✓ Optional: Meter stick or equivalent, protractor

This activity can be used to teach:

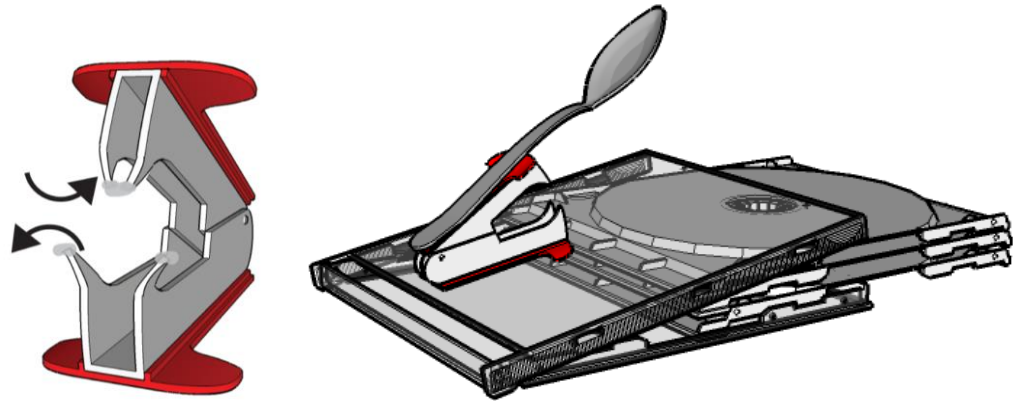
Next Generation Science Standards:

- Forces & Motion (Physical Science, Grade 3, 2-1 & 2-2; Middle School, 2-2)
- Energy (Physical Science, Grade 4, 3-1; Middle School, 3-5)
- Gravity (Grade 5, Physical Science, 2-1)



# Staple Remover Catapult!

Spring into action with stored potential energy!



Students can build and manipulate these scale model catapults to learn about motion, the history of science and technology, and the scientific method.

## Assembly

1. Use pliers to slightly bend in the points of the narrower claw and to slightly bend out the points of the wider claw. Add some glue or tape to the points for safety.
2. If using glue then carefully apply a liberal amount to the plastic side of a claw type staple remover. Press the glued surface down onto to the CD jewel case wood block, or equal. If using CD case - be sure to attach the staple remover with hinge of the staple remover's hinge near the hinge side of the jewel case, as shown. Alternate assembly: wrap tape, rubber bands, or zip ties around the CD case or block and over a single claw of the remover.
3. Apply glue to the top side of the remover. Position the handle of a plastic spoon as shown and press into the glue. Hold the spoon in place until the glue hardens.
4. Check if more glue is needed to ensure a secure attachment of the remover to the base and of the spoon to the remover. Add glue as needed.

## To Do and Notice

1. Aim the spoon catapult in a safe direction. Place a suitable projectile in the bowl of the spoon. Push down on the bowl or on the remover and then release!
2. Tilt the base to change the angle of release. (The media trays can be stacked and inserted into the partial open jewel case, as shown above.) Observe the results.
3. Vary the weight of the projectile and observe the changes in height and distance.

## Science Behind the Activity

A catapult is, in terms of simple machines, a lever. The action of the catapult, however, is directed toward throwing, rather than lifting. Catapults incorporate not only a simple machine but also demonstrate Newton's second law of motion ( $F = ma$ ), and the principle of angular acceleration.

Catapults work by storing potential energy. Forms include the torsion in twisted ropes, the compression of bent strips, or the tension of stretched elastic bands, for example. In this catapult potential energy is stored by bending a metal spring, flat or coiled. When the spoon of the catapult is released the potential energy in the bent spring is converted into kinetic energy (the motion of the remover's top claw, the spoon, and the projectile), as the spring unbends.

**Web Resources** (Visit [www.raft.net/raft-idea?isid=489](http://www.raft.net/raft-idea?isid=489) for more resources!)

General information on catapults - <http://www.catapults.info/>