

# RAFT IDEAS

**Topics:** Motion & Forces,  
History of technology

## Materials List

- ✓ Empty tape dispenser, weighted desk type
- ✓ Paper clips (2)
- ✓ Masking tape
- ✓ Small craft stick
- ✓ Foam
- ✓ Small cap
- ✓ Safe objects for projectiles
- ✓ Rubber band

This activity can be used to teach:

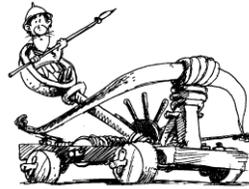
Next Generation Science Standards:

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



# Catapult!

Everybody loves a Siege Weapon



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

## Assembly

1. Insert a rubber band into one of the paper clips so that the paper clip is holding the rubber band in a wire loop. Tape the paper clip onto an end of the tape dispenser so that the loop and rubber band stick up above the edge of the dispenser about 8 mm ( $\frac{1}{3}$ ").
2. Attach the small cap to the end of the craft stick to use as a "bucket" at the end of a pivoting arm.
3. Attach the craft stick to the tape dispenser so that it pivots in the tape wheel wells either by using an attached (bent) paper clip as an axle or by using the tape wheel (if available).
4. Loop the rubber band around the craft stick and secure with tape if required.
5. Use foam placed in the bottom of the tape well to make the pivoting craft stick arm stop at desired angle, releasing the projectile at the optimal trajectory.

## To Do and Notice

1. Place a safe projectile in the cup of the swinging arm.
2. Pull back the arm, and then let it go.
3. Optional: Challenge students to use the scientific method to modify the catapult and make it better (in terms of accuracy, distance, or any other chosen criteria).

## Content behind the Activity

Historically, while bringing misery and pain, new weapons of war also pushed the technological envelope. The catapult is a general term used for several types of medieval weapons, all used to throw or fling objects great distances; these include the catapult, the ballista, and the trebuchet. Catapults and ballistas work by storing tension in ropes, flexed pieces of wood, or rubber (modern versions only.) The trebuchet is simply a pivoting beam with a counterweight. All types were popular during the medieval period in Europe and used in attacks and to lay siege on castles and other fortresses. Large catapults can launch projectiles up to 300 meters (1,000 ft.), enabling the attacker to remain at a safe distance.

Scientifically, catapults are first order levers, the projectile supplying the load. They are, however, far more complicated than that, because they are not trying to lift an object, but rather throw one. Therefore, the catapult does not only cover the basic topic of simple machines, but also Newton's second law of motion ( $F = ma$ ) and principles of angular acceleration (measured in radians per second squared.)

**Web Resources** (Visit [www.raft.net/raft-idea?isid=27](http://www.raft.net/raft-idea?isid=27) for more resources!)