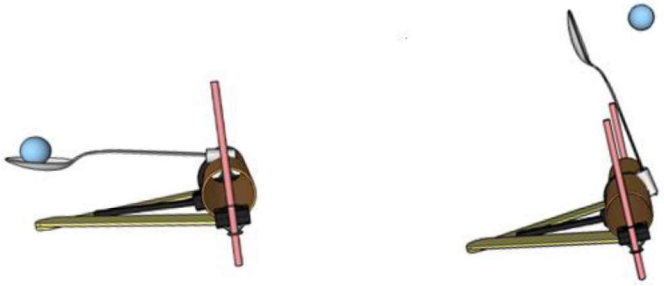
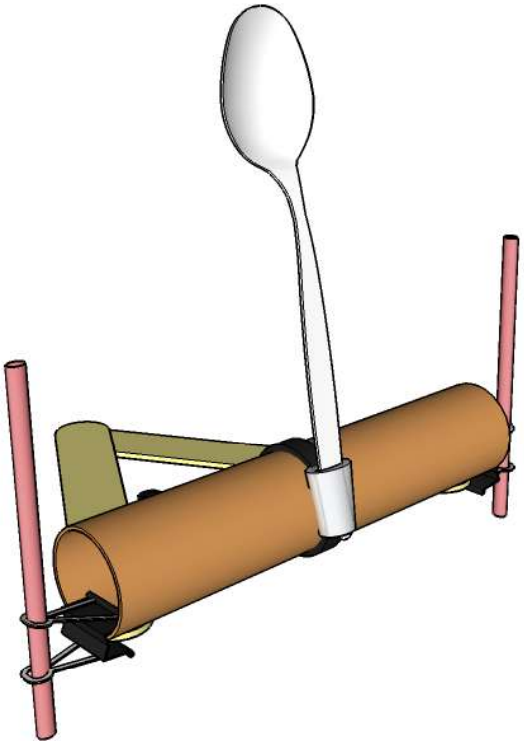
ZIPPY CATAPULT

Zip through the assembly for a quick launch!



Use a bent spoon to store the energy needed to launch a pompom into the air. Explore different launch angles to vary the height reached and where the pompom lands.



Curriculum topics:

- Forces & Motion
- Potential & Kinetic Energy
- Trajectories

Subject:

Physical Science, Social Studies

Grade range: K – 8

Who we are:

Resource Area for Teaching (RAFT) helps educators transform the learning experience by inspiring joy through hands-on learning.

For more ideas visit
https://raft.net/resources-2/

Materials required

- Spoon, flexible and unbreakable (x1)
- Zip tie, releasable (x1)
- Cardboard tube or equivalent (x1)
- Vinyl tubing (x1)
- Binder clips, small (x2)
- Craft sticks, jumbo (x2)
- Double-sided adhesive circle (x1)
- Plastic straw (x1)
- Fuzzy pompoms or equivalent (x4)

Supervision required. Never aim the catapult at others or towards eyes.

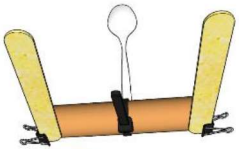
Set-Up

1 Insert the tail end of the zip tie into the vinyl tubing. Place the zip tie so that the smooth (not ridged) side is upward (below left).

2 Insert the handle end of the spoon into the tubing starting on the side closest to the zip tie head. Continue until the handle protrudes from the tubing's other end (above right).

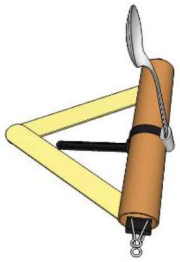
3 Wrap the zip tie around the middle of the cardboard tube, with the spoon facing upward. Insert the tail into the slot in the zip tie head. Pull on the tail to form a loose fit to the tube.

4 Adjust the position of the vinyl tubing until the spoon handle forms an "L" with the tail of the zip tie (see above right). Pull on the tail to tighten.



5 Place the cardboard tube on a flat surface so that the zip tie tail lies flat. Attach the binder clips to each end of the tube (see middle right) securing the craft sticks in place.

6 Remove the paper from the adhesive circle and press the adhesive on one craft stick end. Peel the release paper on the other side of the adhesive. Overlap the free ends of the sticks and bind together with the adhesive (see bottom right).



7 Cut the straw in half and push each half through the loops in the binder clips. Adjust straws to change the catapult launch angle (see title page).

To do and notice

1 Bend back the spoon and load a pompom in the spoon. Release the spoon to launch!

2 Adjust the launch angle as needed (moving the straws or swiveling the zip tie around the tube). Fling the load over a barrier, through a hoop, and strike a target. Bounce it off a surface and land into a bucket. Knock over a structure or other object. The choice is yours!

Content Standards:

NGSS

Forces & Motion:
MS-PS2-2

Energy:
4-PS3-1
MS-PS3-5

Gravity:
5-PS2-1

The science behind the activity

Learners can build and manipulate these catapults to learn about motion, the history of science and technology, and the scientific method. This is also an opportunity for children to participate in open-ended problem solving.

All catapults depend on stored energy, which is used to fling a projectile (load) toward a target. The energy can be stored in a raised weight, twisted ropes, or bent beams. Historically, manual labor would be used to store the potential energy, converting the chemical energy gained from eating food into the mechanical energy stored in the catapult. Gears and levers could be used to enable the storing, over time, of smaller increments of muscle power into a larger amount stored in the device, which would be release all at once.

Scientifically, catapults are first order levers, the projectile is the load. Catapults are more complicated than simple levers, because catapults must throw an object rather than lift one. The study and design of catapults involves simple machines, Newton's second law of motion (F= ma), and angular acceleration.

Learn more

- Create a target course where the catapult must be adjusted to achieve different heights and ranges when the spoon is released
- Use the catapult in your own carnival game
- Count the number of attempts and successful strikes on target and calculate the ratio (successes / attempts)
- Use various materials to build your own scaled version of the catapult
- Construct and attach a mobile platform to the catapult

Visit https://raft.net/resources-2/ to view the following related activities!

Connect-A-Pult
Craft Stick Catapults
Flingy Thingy
Staple Remover Catapult
Roller Racer
Rollback Can

Resources

See these websites for more information on the following topics:

- YouTube video (9:00), History of catapults - https://bit.ly/2QOM6SD
- YouTube video (5:41), Science: trebuchets & catapults - https://bit.ly/2vRJ34V
- YouTube video (7:02), Simple machines - https://bit.ly/33PWT4j
- Interactive virtual catapult - https://sigmazone.com/catapult/