

Title

Catapults

Workshop Overview

Description: Campers will be building their own catapults and learning about simple machines.

Topic Area(s): Simple machines, Projectile Motion

Grade Level: 1-5

Duration: 30-45 minutes

Learning Outcomes:

- By the end of this lesson, campers will learn what projectile motion is.

Hook

Can you hit a target with your catapult?!

Background Information

A **projectile** is an object upon which the only force acting on it is gravity. An object that is dropped is a projectile, an object that is thrown straight into the air is a projectile, even objects thrown in the air at an angle are projectiles! But why is it called a projectile? Well, it is an object, that once *projected* (or dropped, or thrown), keeps moving and only has gravity acting on it.

Today we are going to build catapults utilizing **simple machines** and see if we can hit targets using **projectile motion**!

What are simple machines?

Simple machines are things that make our lives easier by doing work for us, such as pushing or pulling things at large distances. There are 6 different kinds of simple machines: pulleys, levers, wedges, wheel and axel, inclined plane, and a screw!

A **pulley** uses grooved wheels and a rope to raise, lower, or move a load.

A **lever** is bar that rests on a support called a *fulcrum* which lifts or moves loads (think of a see-saw or draw on the board).

A **wedge** is an object with at least one slanting side ending in a sharp edge, which can cut material apart (like a door stopper!)

A **wheel with an axle** lifts or moves loads (a bike).

An **inclined plane** is a slanting surface connecting a lower level to a higher level (ladder).

A **screw** is an inclined plane wrapped around a pole which holds things together or lifts materials.

Materials

Per student:

- 1 plastic spoon
- 7 popsicle sticks
- 5 elastic bands
- 1 cotton ball or pompom (this is the projectile)

Safety Considerations

Only use pompoms or cotton balls for the catapult ammunition!

Procedure

Step 1: Stack 5 popsicle sticks and secure them on each end with two rubber bands.



Stack two more popsicle sticks and secure them on one end.



Step 3: Slide the stack of 5 popsicle sticks in between the stack of two popsicle sticks.



Step 4: Place the plastic spoon on the upper popsicle stick and secure it with two rubber bands at the top and bottom.



Step 5: Using 1 rubber band, secure the plastic center of the spoon to the stack of 5 popsicle sticks by criss-crossing it.



Step 6: Launch away!

Wrap-Up/Debrief

What kind of simple machine is the catapult (*an inclined plane*). We could probably throw these pompoms at a far distance, but in Medieval times 100's of years ago when armies were trying to

knock down other armies' castles, they would use huge catapults to launch giant rocks and other *projectiles* that they wouldn't be able to throw on their own.

Once the campers have their catapults completed, you can set up different challenges for them to land their pompoms into the cups or different targets. This is the time to reinforce the concept of projectile motion: when you pull the catapult back a lot the pompom goes very far, when you pull it back a small amount the pompom goes much shorter.

Additional Resources

http://theresjustonemommy.com/2014/11/11/simple-craft-stick-catapults/#_a5y_p=4816477

<http://www.physicsclassroom.com/Class/vectors/u3l2a.cfm>

<http://www.mikids.com/Smachines.htm>