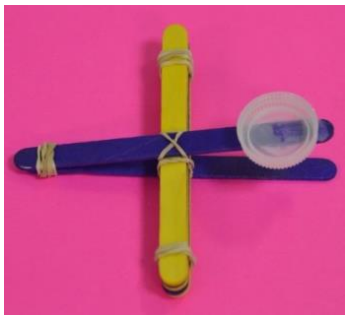
# Catapult Construction

Engineers must master the science and math concepts behind a given technology before they can successfully design and build products for consumers. Let your students explore the engineering process (plan, build, test, modify, re-test) by building catapults and learning the science and math concepts behind them. They can explore force, gravity and angle along the way. Have your students build one or more of these designs and then plan, build and test their own design!

## Craft Stick Slinger



This catapult uses materials you probably have in your classroom right now!

**You will need**:
7 craft sticks
Cap from a water bottle
Glue
Elastic bands

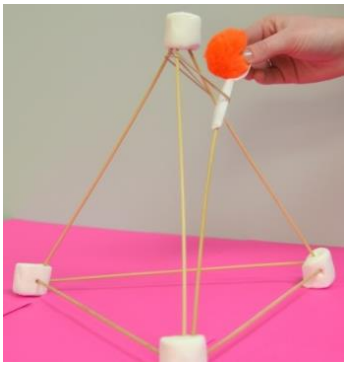
**What to do**:

1. Stack 5 craft sticks together, and use an elastic band to secure both ends.
2. Stack 2 craft sticks together, and wrap an elastic band around one end.
3. Separate the 2 craft sticks at the open end and place the stack of 5 craft sticks between them, as close as possible to the middle.
4. Wrap an elastic band in an “X” pattern around the middle of all of the craft sticks to hold the catapult together.
5. Glue the bottle cap about 0.5 cm from the open end of the top craft stick to serve as a launching platform.
6. Allow the glue to dry and harden for several hours.
7. Load a pompom, a mini marshmallow or other soft item into the bottle cap. Push down on the top craft stick just above the cap and release to launch the object.

**Try an open-ended exploration of variables to see how they affect flight pattern and distance**:

- Add more or less craft sticks in order to change the angle
- Use different sized elastic bands
- Change the size and weight of the item being launched

# Marshmallow Launcher



Build a 3-D shape and test its functionality as a launcher for an integrated math and science lesson.

**You will need**:
4 marshmallows
7 skewers (or wooden coffee sticks)
Elastic bands
A plastic spoon
Tape

**What to do**:

1. Make a triangle using 3 skewers and 3 marshmallows and lay it down on a flat surface. Push one of the remaining skewers into each of the 3 marshmallows so that they stick up vertically from the triangular base. Gather the three vertical skewers together and secure them with the remaining marshmallow. You should now have a triangular-based pyramid made from 6 skewers and 4 marshmallows.
2. Tape the handle of a plastic spoon onto the end of the seventh skewer.
3. Push the skewer with the attached spoon into one of the marshmallows so that it's on the outside of the prism.
4. Loop an elastic band (approximately 7 cm in length) over the top marshmallow and then put the spoon through the elastic. The elastic will act as a sling for the skewer spoon.
5. To use the catapult, it should be oriented so that the marshmallow containing the spoon skewer is pointed away from you.
6. Stabilize the catapult by holding the base. Load the spoon with a pompom or other soft object and pull back on the spoon.

**Explore the variables with some open-ended play**:

- Use different building materials (straws, coffee sticks, play dough)
- Test different sized elastics or a different number of elastics
- Build different 3-D shapes and compare launching tactics

## Clothes Pin Chucker

This is a simple design for our youngest engineers, and it works well too!

**You will need**:
Clothes pin
Sandwich-sized paper plate
Glue
Cap from a water bottle
Craft stick

**What to do**:

1. Place the paper plate upside down on a flat surface.
2. Glue a clothes pin to the bottom of the paper plate so that the open end of the pin lines up with the bottom edge of the plate.
3. Glue a craft stick onto the clothes pin so that the end of the clothes pin is even with the metal spring.
4. Glue the bottle cap onto the end of the craft stick, away from the plate and clothes pin.
5. Let the glue dry and harden before using.
6. Place the item to be launched into the bottle cap. Press down on the craft stick so that the clothes pin opens and let go quickly.
7. Have fun launching various items and exploring how far they travel.

## Pop Can Pitcher

Here is a fun and easy catapult made from an empty pop can!

**You will need**:
Pop can
Elastic bands
Plastic spoon

**What to do**:

1. Find an empty pop can and rinse it to remove any residue.
2. Wrap several elastic bands around the can so that they are quite tight.
3. Place a plastic spoon through the elastics with the bowl facing away from the can.
4. Launch a soft object (pompom, Styrofoam ball or mini marshmallow) and adjust the launch angle to maximize distance travelled.

**Explore the variables with some open ended play**:

- Use different types of elastics (long, short, thick, thin)
- Change the launch angle by picking up the pop can and varying the angle at which you hold it.