

## Paddle Boat Engineering

### Design a boat that propels itself using rubber bands

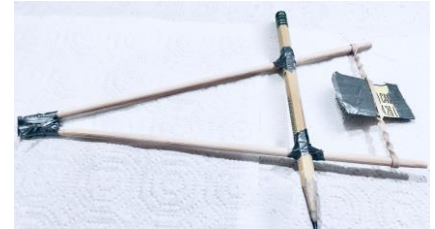
Attach a simple paddle wheel to your toy boat, wind it up and watch it cruise!

#### Activity Challenge

Build a toy boat that uses a rubber band and paddle wheel to propel itself in water. The only requirements for this challenge are that the boat floats and moves. It's a great opportunity for creative engineering.

#### Preparation

1. Review the Materials Needed list and gather materials for the boat.
2. Find a large water container in which to test the boat. A tub is ideal, but a sink or large basin will work as well.



#### To Do

1. Review the boat designs that are shown. Using the materials you have on hand, create a boat of your own design. Consider making a few different boats to test. Be creative- make it your own.
2. Test the boat(s) to be sure it floats.
3. Decorate it however you want.
4. Make a paddle wheel. See examples in the pictures shown and design your own. Think about different kinds of materials. For example, the ends of plastic spoons might work well.
5. Attach the paddle wheel to the boat using a rubber band. Make sure there is enough room for the paddle wheel to spin freely.
6. Fill up a tub, sink or large container with water.
7. Start testing your boat(s).
8. Adjust, redesign and keep testing until you have a paddle boat(s) that travels quickly in a straight line.
9. Make a note of the materials you think work the best for both the boat and the paddle wheel.



#### Materials Needed

- Items for the boat body such as: cans, plastic bottles, plastic food containers, sticks, tongue depressors, pencils, bamboo skewers, chopsticks, cardboard, etc.
- Fasteners such as rubber bands, hair ties, scrunchies, tape, etc.
- Material for the paddle wheel such as cardboard, plastic spoons or pieces of wood
- Rubber band for propulsion

#### Grade Range

3-8

#### Topics/Skills

Science: Buoyancy; Density  
Engineering: Designing, prototyping and testing

#### Learning Standards

NGSS: [Matter and its interactions](#); [Physical Science](#); [Engineering practices](#)

#### Duration

10-30 Minutes

#### Prep Time

10 Minutes

### Guiding Questions

Why do you think these materials work well? Are they more buoyant, less dense, stiffer, stronger, etc.?

### Extension

- Build a paddle wheel boat without any glue or tape.
- Engineer a way to move the boat using something other than a paddle wheel.
- Create two boats of different design - one shorter in length but wider and one longer but thinner. If possible, use the same materials. Test each design out using the same paddle wheel. See if there is a difference in speed and/or direction.

### The Science behind the Activity

You may have seen images of the [old steam powered paddle boats](#) that used to travel our rivers and harbors. You can tell a paddle boat by the large drum of paddle boards either on the boat's sides or near its stern (back). Today most boats you see driven by a paddle are canoes or kayaks. Either powered by steam or by people, paddles push back on the water making the boat move forward. The rubber band powered boat in this activity converts the stored (potential) energy of the wound-up rubber band to kinetic energy when the rubber band is released. This kinetic energy moves the paddle wheel which pushes against the water and moves the boat.