



Mechanical Engineering: Paddle Boat



Badge Overview

Explore how paddle boats work and engineer your own paddle boat. When you've earned this badge, you'll know how to build and test a paddle boat and understand buoyancy, potential energy, and kinetic energy.

Badge Components

1. Explore how paddle boats work

Steam-powered paddle boats were common on American rivers in the 1800s, but now you're more likely to see smaller versions paddled by people. Both kinds work the same way, by pushing water with paddles mounted on wheels.

2. Design and build a rubber band-powered paddle boat

Build your paddle boat using one of these videos to help [Paddle Boat Design 1](#) or [Paddle Boat Design 2](#)

3. Test your rubber band-powered paddle boat

STOP! Check with an adult first to make sure it is OK for you to test your boat.

Test how well your boat works in the tub or a pool.

Can you answer these questions?

(The answers to these questions and an explanation are at the bottom of this section.)

- Where is the energy stored that makes the paddle spin? The term for stored energy is POTENTIAL energy.
- How can you increase the rubber band's potential energy? You can tell when potential energy stored in the rubber band is being used because you see it move. The term for motion energy is KINETIC energy.
- What are some examples you can see of kinetic energy that happen when your paddle boat moves through the water?

4. Analyze and share your results

Can you make your paddle boat work even better? Analyze how your boat performed; what do you need to change or improve?

5. Brainstorm ways to improve your design

Try to make it go faster or further. You will need to time your boat or measure how far it goes so you will know if it improved. Remember to make sure you only change one VARIABLE or thing at a time so you know if it makes a difference. This is called making it a **FAIR TEST** and is an important part of the **SCIENTIFIC METHOD**.

Now you have the best boat you can make, show someone in your house how amazing it is!!

WHAT'S HAPPENING? When you wind up the paddle, the rubber band stores the energy. This is POTENTIAL energy, which occurs because the twisted rubber band is not in EQUILIBRIUM (balanced/even)—you have to hold it in place or it will unwind. When you let go of the paddle, the rubber bands unwind to rotate the paddle and push the boat forward. That unwinding is the CONVERSION OF POTENTIAL ENERGY TO KINETIC ENERGY (kinetic energy is the energy of motion). The rubber band moving the paddle, the paddle pushing on the water and the boat moving forward are all examples of kinetic energy.

- ANSWER KEY**
- a. The potential energy is stored in the rubber band.
 - b. You can wind the rubber band more to increase the potential energy.
 - c. The rubber band unwinds; the paddle spins; the boat moves; waves spread out.

Materials

• Paddle Boat Design 1

Pens, rubber bands, a Tupperware container and card stock

OR

• Paddle Boat Design 2

A plastic bottle with 4 flat sides, a rubber band, chop sticks, a milk jug and duct tape.

- Access to water (e.g. tub or pool)
- Yard Stick or tape measure
- Stopwatch or timer

Florida Educational Standards

The content of all Girl Scout national proficiency Badges and Journeys have been correlated by grade level to national and state learning objectives.

[Click here](#) for more information on how Girl Scout Badge-work supports Florida's educational standards.



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