


# Week 4: Boy, oh Buoyancy

There's more to water science than water's circulation between air, land and sea. Water lets you see energy moving from place to place as demonstrated by waves. Floating in water lets you explore the relationship between three physics concepts: density (the amount of matter in an object), buoyancy (a force that makes something float) and gravity (a force that causes two objects to pull together). So get your hands wet by experimenting with physics in the water.

## experiment

# FLOAT YOUR BOAT

### Materials

Small container with lid, like a pill container or film canister 

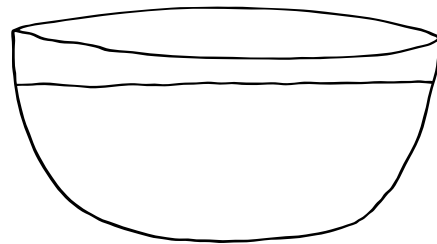
Small, heavy objects (coins, marbles, screws, etc.)

Small, light objects (paper clips, fabric, beads, etc.)

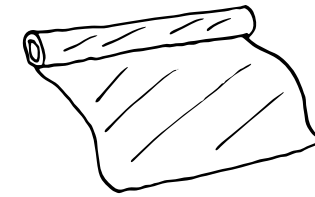
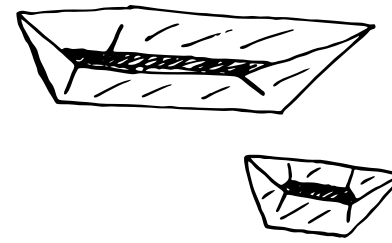
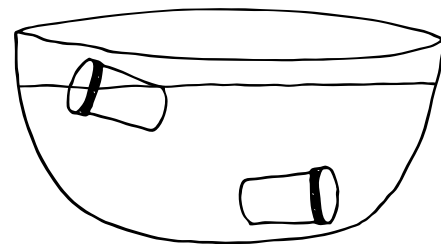
Aluminum foil

Water

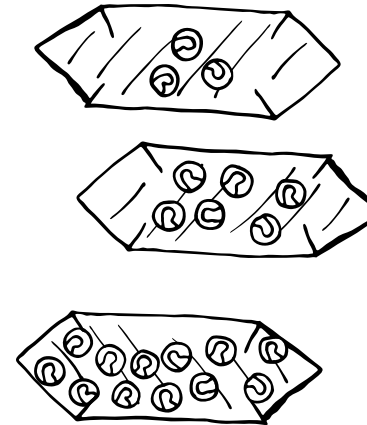
Large bowl, sink or tub



Fill a large bowl, sink or tub with water. The small container—like a pill container or film canister—is your submarine. Figure out how to make it float on top of the water and sink to the bottom using any of your objects. Finally, see if you can make your submarine hover in the middle of the water—no part of it can be touching the bottom or poking out the top.

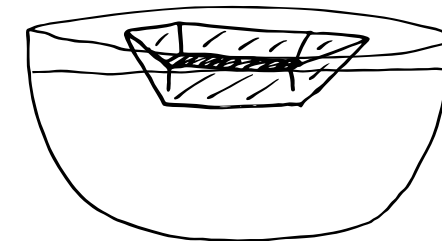


Put the submarine aside. Take a square piece of foil and make it into a boat. Test to see if it floats. Start placing objects in your boat (pennies work great). How many can it hold before it sinks?



### What's happening?

In the water, gravity is pulling down on the submarine while a buoyant force is pushing up. Adding or removing objects to the container changes the density of the sub and the boat. If the density of the sub or boat is more than the water's density, the vessel will sink. If the sub's density is less than the water's density, it will float. If the densities are the same, the vessel will hover.



### Game on!

See whose vessels can hold the most weight before sinking. Make a boat with a smaller piece of foil, like 9" by 9", and see if it can hold the same weight as your larger boat. If not, can you change its shape so that you're successful?

### More ways to play with water

Try these simple density experiments: Put an orange in water with and without its peel (the trapped air pockets in the peel allow it to float). Float a can of diet vs. regular pop and see what happens (the sugar in regular pop makes it more dense, so it sinks).

Float in a pool or tub and let your arms relax and float at your sides. You can actually feel the water pushing back up on them, making them buoyant.

Explore buoyancy on a big scale with MSI's *U-505 Submarine* ([msichicago.org/u505](http://msichicago.org/u505)).

### How many pennies can your boat hold?

	# of pennies	sink	float
design #1	0		
	5		
	10		
	15		
design #2	0		
	5		
	10		
	15		