



Buoyant Boats

Building/Design Challenge

Grades 2 - 8

Challenge yourself to create a boat that stays afloat with materials around your home. Test your engineering skills by adding weight to see how much your boat can hold before sinking!

Background Information

What does it mean to float or sink? It's a physical interaction between a solid object, like a boat, and a fluid, like water. Fluids are substances that do not have fixed shapes and flow easily, they can be a liquid or a gas. A fluid can also float or sink in another fluid, like oil on water or helium in air.

Density is one of the properties shared by solids and fluids. How dense an object is depends on how much space it takes up (volume), compared to how much matter it has (mass). All matter, including both solid objects and fluids, are made up of particles. Density is essentially how much matter is packed into a given space. If a lot of matter is packed into a small space, the object or fluid will be denser. If a small amount of matter is spread out over a large space the object or fluid will be less dense.

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

Water, as a fluid, has a density. If something is more dense than water, it will sink; if something is less dense than water, it will float. Large boats, that we might see around our province, have hulls (bodies) made of dense steel. How do boats float if the materials they're made from have a higher density than water?



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Background Information Cont.

You can predict whether an object, like a boat, will sink or float by thinking about water displacement, meaning how the water is pushed out of the way. If the weight of the boat is more than the weight of the volume of water that is being displaced, the water 'can't hold it' and it will sink. If the weight of the boat is less than the weight of the volume of water that is being displaced, it can balance itself by floating. The amount of water that is displaced depends on the boat's volume. Understanding how much water is displaced is important, as the weight of the displaced water is equal to the upward force that holds the boat up, the buoyant force.

Materials

- Find materials to use to produce your boat. These should be strong enough to carry weight without risk of breaking. You can also combine different types of materials to build your boat. This could be cardboard, plastic, tin foil, etc.
- A place for your boat to float. This could be a large bowl of water, sink, or bathtub.
- Items to act as weights, in order to see how much your boat can carry before it sinks. This could include small change, rocks, or marbles.

Instructions

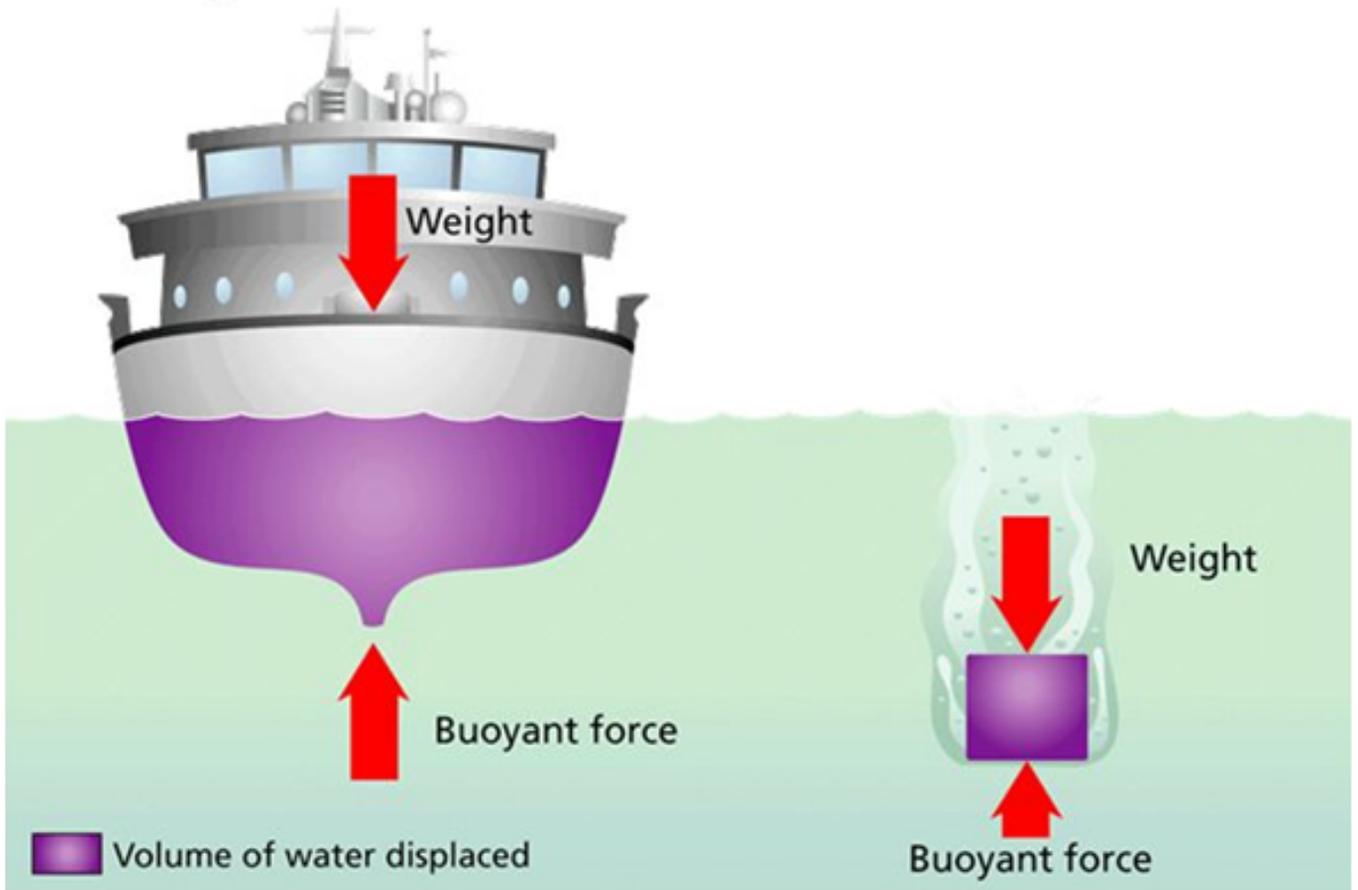
1. Use the materials you find to make a boat that can float in water.
2. Begin adding weight to see how much your boat can hold before it sinks.
3. Think about what modifications would allow your boat to carry more weight. Modify your new design and evaluate your results!
4. You can try two different boats at once using different materials or designs and see which one works better!



Buoyant Boats

Diagram:

Buoyancy in Action





Buoyant Boats

Thing to Consider

- Be mindful when choosing materials for your boat. You should choose materials that are water resistant.
- Think about the shape of your boat, and if it will help displace more water.
- While producing your boat, keep the volume and shape of your product in mind, in order to help it float.

Questions for Reflection & Activity Extensions

- Your boat was made for freshwater. What considerations would you need to make if trying out your boat in salt water? Will the density of salt water be different?

