

CURIOSITY AT HOME

BOATS AFLOAT



Using the Engineering Process of Design, Test, and Redesign, explore buoyancy and gravity by designing a boat.

MATERIALS

- Aluminum foil
- Scissors
- Shallow plastic or glass container (preferably clear)
- Pennies, metal washers, or any other small weights
- Water
- Science notebook or paper
- Something to write with

PROCEDURE

- Copy the table below in your science notebook or create your own.

Trial #	Boat Design	Does it Float?	# of Pennies Carried	Observations
1	Flat sheet of aluminum foil			
2				
3				
4				
5				

- Fill the shallow container at least halfway with water.
- Cut three to four 5 in. x 5 in. sheets of aluminum foil.
- Try floating a flat sheet of aluminum foil on the water. Observe what happens. Record your results in your chart in your science notebook.
- Can the aluminum foil sheet hold any weight? Add a penny or two to find out.
- **Design Challenge:** Build a boat that as hold as much cargo (pennies) as possible.
 - Think about the boats you have seen.
 - Using a 5 in. x 5 in. sheet of aluminum foil, design and build a boat that can carry as much cargo (pennies) as possible.



Show us how you're being curious! Share your results with us.

PACIFIC
SCIENCE
CENTER



CURIOSITY AT HOME

BOATS AFLOAT

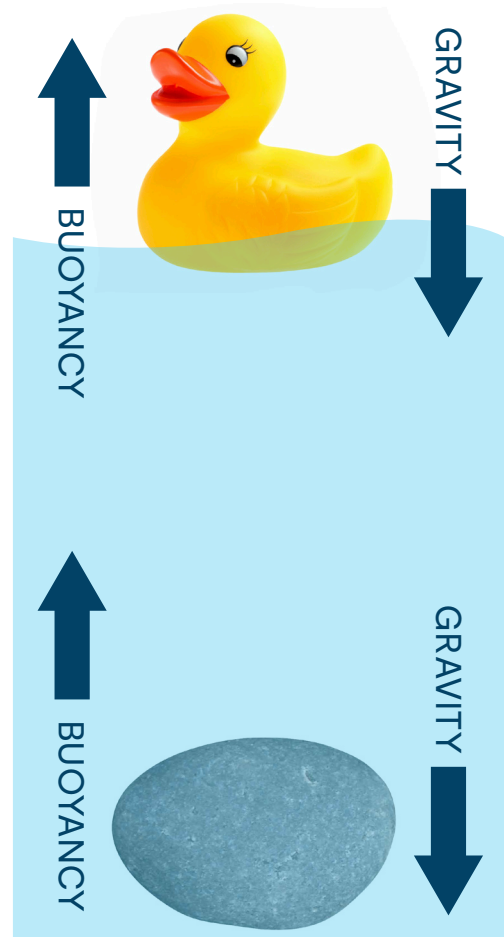


- Test your design.
 - Place your boat in the water to see if it floats.
 - Add pennies until the boat begins to sink.
 - Record your results in the chart.
- Redesign based on what you've learned.
 - Redesign your boat to see if you can hold more cargo.
 - Things to think about:
 - ◇ Does the shape of the bottom of the boat change how much weight it can hold?
 - ◇ Does the shape of the bottom of the boat change how stable the boat is?
 - ◇ How does the placement of the weight affect the boat?
 - ◇ Are there materials that you could add to the aluminum foil to make the boat float better?

WHAT'S HAPPENING?

When objects like your boat are placed in a liquid like water, two forces are acting on them. First is the downward pull of the force of gravity, which is measured by the object's weight. Second is the upward push of a force called buoyancy. **Buoyancy** is equal to the weight of the amount of liquid displaced, or pushed away, when the object is placed in the liquid. If the object weighs less than the weight of the liquid it displaces, it will float. If the object weighs more than the displaced liquid, it will sink.

To create enough buoyancy to float, heavy objects need to take up much more space than light objects. A metal boat may weigh a lot, but a large amount of the volume inside the boat is full of air, which weighs a lot less. The large surface area of the boat combined with the hollow space filled with air means the boat displaces enough water to have a high buoyancy, allowing it to float!



CURIOSITY AT HOME

BOATS AFLOAT



K-2 GRADE EXPLORATION

- How did you choose your boat's design?
- What were some changes you made to improve your design?
- What are boats used for?
- Are boats that are used for different things shaped differently (examples: boats that carry lots of people, boats for fishing, boats for pushing other boats)?
- Can you try another shape to see if it works better?



Show us how you're being curious! Share your results with us.

PACIFIC
SCIENCE
CENTER

