Float My Boat

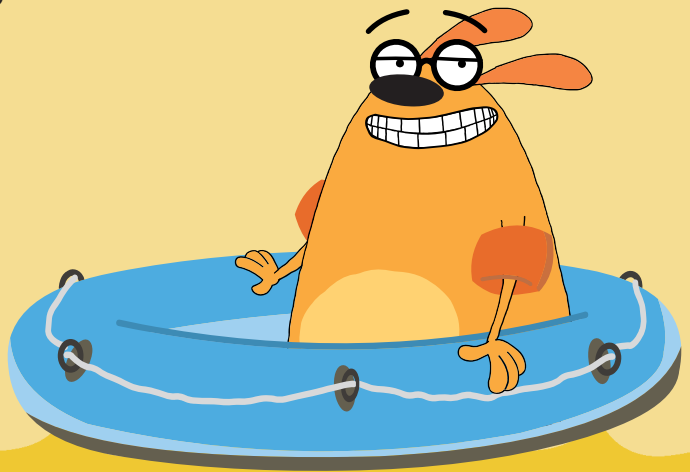
Activity 3

Even large ships weighing hundreds of thousands of tons stay afloat. But how? In this activity, kids investigate floating by building tinfoil boats and loading them with pennies until they sink. Through testing, kids will discover an important pattern—a boat's size and shape make a difference in how much of a load it can carry. Time to roll up the shirtsleeves and dive in!

Lead the Activity

1. **Introduce Ruff's Challenge.** (5 minutes) Explain that today's challenge is to learn more about why things float by making tinfoil boats that can carry a load of pennies.

2. **Round 1: Build Boats.** (10 minutes) Hand out the activity sheets and have kids do steps 1–4. The exploration in round 1 helps kids figure out the basics of boat building and of loading pennies. It also prepares them for a discussion of boat design and capacity. Tell kids to keep each boat they make and to record on a sticky note or piece of paper the number of pennies each boat held. After round 1, they will display each of the boats they made.



3. **Discuss What Happened.** (15 minutes) Bring the group together. Have kids put their boats and tally papers in a sequence. Go from the least pennies held to the most, like a number line. Ask:

   - What features do boats that hold a lot of pennies have in common? *(Size—big boats hold more pennies; strength—sturdy boats don't crumple under a load; and stability—wide boats don't roll over as easily as narrow boats.)*

Tell kids that when a boat floats, it pushes aside (i.e., displaces) water to make room for itself. But, the water around the boat pushes back. And the more water a boat displaces, the more force there will be pushing back on the boat. This force supports the boat. Boats that displace a lot of water can generally carry a heavier load than boats that displace only a little water. See if the boats made in round 1 confirm this idea.

   - Now that you've seen what kinds of boats hold a lot of pennies, list some ways to make a boat that carries a heavy load. *(Help kids see the connection between how much water a boat displaces and how much it can carry.)*

Materials

- Activity sheet for each kid
- 6–10 six-inch squares of tinfoil per kid
- Pennies (100 per kid)
- 1 dishpan or bucket half-filled with water per two kids
- Towels
- Rulers
- Sticky notes or pieces of scrap paper

National Science Education Standards

Grades K–4
Physical Science:
Properties of objects and materials

Science and Technology:
Abilities of technological design

Grades 5–8
Science and Technology:
Abilities of technological design

4 Round 2: Build more boats. (10 minutes) Now that kids understand that displacing water is related to how much a boat can carry, have them refine and retest their designs by completing step 5 on their activity sheet. Tell kids to keep their champion boat—the one that carried the most pennies—and to record how many pennies it held.

5 Share effective designs. (15 minutes) Gather as a group. Have each kid show the group his or her champion boat. Compare boats that held similar numbers of pennies. How are they alike and different? *(Kids may just describe the boats' features. Remind them about the role of displacement. Boats holding similar numbers of pennies should displace similar amounts of water.)*

6 Award points. (5 minutes) Time to rack up some points. Gather as a group. Review the activity's key ideas by asking everyone the following questions. Each question is worth 50 points. Whenever you hear an acceptable answer, award 50 points to the entire group.

- What are some things that happen when you add more pennies to your boat? *(Answers include making the boat weigh more and having it sink lower into the water. Also, tinfoil boats often bend when they're heavily loaded and tip when they're unevenly loaded.)*
- Why do boats float? *(Water pushes on the bottom and sides of a boat, holding it up.)*
- What kinds of features help boats hold a lot of pennies? *(Answers may include a large size, sturdy construction, and stable shape.)*
- What would a tinfoil boat that pushes aside a lot of water look like? *(It would have medium-sized bottoms and medium-sized sides. This combination displaces more water than a boat with a large bottom and small sides or one with tall sides and a small bottom.)*
- Doing science and engineering involves making predictions, testing them (which includes doing something, making observations, and drawing conclusions), and sharing your results. Give an example of how we did these steps today. *(Answers will vary.)*

Activity Tips

- Place towels underneath the water container to minimize mess.
- Remind kids to place pennies gently onto their boats. Dropping them can sink a boat that might otherwise hold a larger load.

Float My Boat

Today, your challenge is to build tinfoil boats and test different designs to see how many pennies you can load without sinking your boat. Let's dive in!

What to Do

1 Get what you need.
- 6-inch squares of tinfoil • Pennies
- Ruler • Container half-filled with water

2 Round 1: Build boats. Make a boat by bending the tinfoil. Draw your design in the data table.

3 Make predictions. On the data table, enter your prediction for how many pennies your boat can hold before it sinks.

4 Test the design. Float your boat. Add pennies one at a time. Keep going until the boat sinks. Count how many pennies your boat held. But don't count the last one—it sank the boat! Enter this number in the data table. Repeat steps 2–4, making a total of three boats.

5 Round 2: Build more boats. Make new designs, using what you learned about the height and thickness of the sides, the size of the bottom, and how to position the pennies. Record your designs, predictions, and test results in the data table.

	Draw Your Design (label side height & bottom length & width)	Predict how many pennies this design can carry without sinking	Number of pennies actually carried
Round 1: Initial Designs (Steps 2–4)			
1			
2			
3			
Round 2: Revised Designs (Step 5)			
4			
5			
6			

Chew On This!

When a boat floats, it settles into the water, pushing the water aside to make room for itself. But it's a two-way pushing match—the water pushes back on the bottom and sides of the boat. This force, called buoyancy, holds the boat up. The more water a boat pushes aside, the more force there will be pushing back on the boat and supporting it. This is why a boat's size and shape make such a difference in how much of a load it can carry without sinking.

Dig Deeper

So, sailor, ready to "sink" your teeth into a few more challenges? Try these:

* Can a really big tinfoil boat carry a lot of pennies? Build several boats using 12-inch squares of tinfoil. How many pennies does it take to sink these boats?
* Does the kind of water you float a boat in make a difference? Test to discover if your boat holds more pennies when it floats in fresh water or in salt water. To make salt water, dissolve two cups of salt in a gallon of warm tap water.
* Make an object that doesn't float or sink—it "flinks!" Get the Flinker challenge from the ZOOM Web site at pbskids.org/zoom/activities.

PBS KIDS GO!

Watch FETCH! on PBS KIDS GO! (check local listings) and visit the FETCH! Web site at pbskidsgo.org/fetch.

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Fold

FETCH!

Float My Boat

Oh no! I was filling the tub and fell asleep! Now my entire doghouse is under three feet of water! If I could just get a raft to pile all my precious belongings onto, then they won't get soggy. Wait, that's it! You can help me design a boat that will carry as much stuff as possible. Then, I'll build it and load on the Fetch 3000, my bark-o-lounger, and my collection of squeaky toys. But hurry, my chair's getting ruined!