

Tin Foil Boat Challenge

Have you ever wondered how a ship made of steel can float? Or better yet, how can a steel ship carry a heavy load without sinking? In this project you will make boats out of aluminum foil to investigate how their size and shape affects how much weight they can carry.

The Background Information:

- The science behind floating was first studied by an ancient Greek scientist named Archimedes. He figured out that when an object is placed in water, it pushes enough water out of the way to make room for itself. This is called displacement.
- Have you ever experienced displacement? Of course, you have! Remember the last time you got into the bathtub and the water level went up? That's displacement. When you got into the tub, water got out of your way to make room for you, so the water level in the tub got higher.
- When an object enters water, two forces act upon it. There's a downward force (gravity) that's determined by the object's weight. There's also an upward force (buoyancy) that's determined by the weight of the water displaced by the object.
- An object will float if the gravitational force is less than the buoyancy force. So, in other words, an object will float if it weighs less than the amount of water it displaces. This explains why a rock will sink while a huge boat will float. The rock is heavy, but it displaces only a little water. It sinks because its weight is greater than the weight of the small amount of water it displaces. A huge boat, on the other hand, will float because, even though it weighs a lot, it displaces a huge amount of water that weighs even more.

The Challenge:

Using only 1 sheet of aluminum foil, design a boat that is capable of holding the most pennies possible without sinking.

The Materials:

- 1 sheet of aluminum foil that is 12 inches x 18 inches
- A container like a sink, tub or bucket to float your boat in
- Enough water to fill the container with at least 5 inches of water
- Approximately 50 pennies or marbles

The Experiment:

- Fill a container with at least 5 inches of water
- Use the Ask, Think and Plan sheet on the next page to come up with a boat design that you think will work best
- Build your boat and place it in the water to make sure it floats
- Add 1 penny at a time, making sure to keep track of the number of pennies you have added, until your boat sinks
- Test the same boat again trying different placements of the pennies
- Think about what worked and what didn't work and design a new boat to see if it will hold more pennies.
- Fill in the conclusion section to share what you have learned.



ASK – what do you already know about boats?

THINK – what design do you think will work best?

PLAN – draw a sketch of what you think your boat will look like.

CREATE AND TEST – build your boat and put it in the water to make sure it floats. Add 1 penny at a time (keeping track of how many pennies you have added) until the boat sinks.

QUESTIONS TO CONSIDER – did you pile the pennies all together in the center of the boat? Or at one end of the boat? Did you spread your pennies out? How do you think that affected how long it took your boat to sink? Try the experiment again to see how the placement of the pennies affects how soon the boat will sink.

RE-DESIGN AND TEST AGAIN – after seeing how many pennies your first boat held, build another boat using another piece of aluminum foil to see if you can create a design that will hold more pennies.

CONCLUSION – how did the placement of the pennies affect how soon the boat sank? What design features of the boat do you think made it float longer?