

**Design Challenge:**

Design and build a boat from aluminium foil that can hold as many weights (coins, washers, marbles, pebbles etc.) before sinking or capsizing.

Materials:

- shallow plastic bin
- water
- towels
- weights (coins, washers, marbles, pebbles etc.)
- aluminium foil

Getting Ready:

Cut the foil into uniform squares. The foil squares can be anywhere from 10 x 10cm to 30 x 30cm. Keep in mind that the larger squares will make larger boats, which may require more weights to sink it. Fill your plastic bin with a small amount of water. Have towels ready to dry your hands or clean up spills.

Instructions:

Build the boats. Test them to see if they float before adding any weights. Count the number of weights added to each boat before they sink. Discuss evenly distributing weight and the effect that has on the boat.

Trouble Shooting:

- If a boat doesn't remain upright, consider a wider design.
- If a boat sinks before you think it should make sure you are distributing weight evenly. Discuss the importance of balancing weight so not to overload a boat.
- Wide, flat bottomed boats will hold the most weight.

Relevant Terminology:

Buoyancy	An object's ability to float in water or other fluid.
Density	How much something weighs as compared to how big it is - or an object's mass per unit volume. Something big and light like a balloon, has low density. Something small and heavy, like a rock, has high density.
Displacement	The moving of something from one place to another. For example, when an object is placed in water, it pushes some water out of the way and takes its place.

Questions to Ask After the Activity:

- What kind of real-world boat did your boat look like?
- How many weights was your boat able to hold? Did it matter how or where you placed the weights in your boat?
- After testing your boat, did you make any changes to the shape of your boat? Why or why not?
- What shapes seemed to work best?
- What could you change to make your boat hold more weight before sinking?
- Did your boat tip over before it sank? And if so, what changes did you make to stop this from happening?
- Why do the weights float when placed in the boat but sink when placed directly into the water?

Engineering Connections:

For a boat to float, it needs to weigh less than the same amount, or volume, of water. To make this happen, engineers must build boats so that they have giant pockets of air inside them.

Science Connections:

Why does a rock sink in water while a giant cruise ship will float? An ancient Greek scientist named Archimedes was the first person to figure out the science behind what makes some objects float while others sink. He found that when an object is placed in water, it pushes enough water out of the way to make room for itself. You've seen this idea in action if you have ever stepped into a full tub and had the water level rise and spill over the top to make room for you.

