



## Engineering—The Foil Penny Challenge!

**Overview:** Have you ever wondered how ships that are incredibly heavy can float on the water? How can they carry heavy cargo without sinking? Today's engineering challenge is going to test your STREAM skills as you engineer the ultimate vessel to carry pennies.

**Activity:** Using tinfoil design a boat that can hold the maximum number of pennies without sinking.



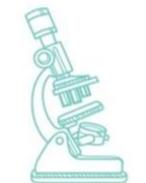
### Materials:

1. Aluminum/Tin foil—Tin/aluminum foil is a good material to use as it is relatively inexpensive, easy to shape, and can be reused or recycled.
2. Pennies—the more the better!
3. Water—regular tap water works just fine. If used in a container instead of the sink, after you are through you can use the water to feed your plants or grass.
4. Container for water or just use the sink—either works well. If you have multiple engineers, you may want to do this outside and use several containers. The size of container should be larger than the canoe or barge being build.



### Procedures:

1. Gather your materials and set them up in a place that is okay to get wet. This activity is well suited for the outdoors.
2. Fill your container with about six inches of water. The more water you have, the more dramatic it will be when the canoe or barge sinks.
3. Tear off a section of tinfoil. The size of the tinfoil will be relative to the number of pennies it can hold and relative to the size container you have.
4. Shape the tinfoil into a boat and see if it floats. If the boat does not float, try another shape/design until it does.
5. An interesting variation is to tear off two tinfoil sections that are the same size. Build a boat out of one that floats then crumple the other up into a ball and see if it floats. The crumpled ball will not float because it is denser than the boat. The boat displaces more water which is why it floats.
6. Once your boat is seaworthy, start adding pennies to it until it sinks.
7. Record how many pennies it held until it sank.
8. An interesting variation is to record the number of pennies it holds and graph the number per attempt.
9. Use different designs to see which is best to hold the maximum number of pennies.
10. After making the best possible design, clean up and recycle your materials.

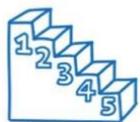
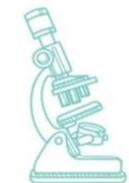


### Key Terms:

*Provide an engaging environment where kids explore, play and discover.*

# kidSTREAM

1. **Engineering**—engineering is the process of creating and building structures, products, and systems by using math and science.
2. In physics, **Buoyancy** is the force an object making that object rise or move upward. It comes from the Spanish word for "float", *boyar*. Buoyancy is made by the difference in pressure put on the object by the fluid or air that the object is in.
3. **Volume** refers to the amount of space the object takes up. In other words, volume is a measure of the size of an object, just like height and width are ways to describe size. If the object is hollow (in other words, empty), volume is the amount of water it can hold.
4. **Displacement** is defined as the act of moving someone or something from one position to another or the measurement of the volume replaced by something else. When an object is fully submerged in water, it will displace its own volume.
5. **Density**—if the object has exactly the same density as the liquid, then its buoyancy is the same as its weight. It will not sink or float. An object with a higher average density than the fluid has less buoyancy than weight and it will sink. That is why pebbles do not float. Although a ship is made of steel which is denser than water, it floats because it encloses a volume of air and the resulting shape has an average density less than that of the water.



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