



Name: \_\_\_\_\_

Block: \_\_\_\_\_ date: \_\_\_\_\_

# PENNY BOAT CHALLENGE

**Problem:** Can the shape of a boat affect the amount of buoyancy it has?

**Research:** Buoyancy is the upward force that keeps things afloat. When placed in water, an object will float if its buoyancy is greater than its weight. And it will sink if its weight is greater than its buoyancy.

"People have been aware of objects floating on water (or sinking) since before recorded history. But it was not until Archimedes of Syracuse came along, that the theory of flotation and the buoyancy principle were defined." Archimedes was a mathematician born in 287 BCE, in the city of Syracuse on the island of Sicily . Archimedes is best remembered for a discovery involving the crown of King Hiero II.

## Procedure:

- Cut three pieces of 15 cm by 15 cm (square) aluminum foil.
- Think up a boat design and construct your boat using **only** one piece of the heavy duty aluminum foil.
- Pennies are the only item you may add to your boat. Your boat cannot be attached to anything.
- Slowly add pennies to your boat. Once water enters the boat, or any part of the boat touches the bottom of the container, your boat is considered sunk! (The boat must remain floating for 5 seconds before it is considered a successfully added penny... after 5 seconds you may then add another penny)
- The last penny added (that sunk the boat) will not count in the total amount held.
- Use the chart below to make sketches of your boat and to keep track of your trials, errors, and successes.

Trial 1	Trial 2	Trial 3
Prediction: Number of pennies: _____	Prediction: Number of pennies: _____	Prediction: Number of pennies: _____
<b>Sketch 1</b>	<b>Sketch 2</b>	<b>Sketch 3</b>
Outcome: Successful? ( Y / N )	Outcome: Successful? ( Y / N )	Outcome: Successful? ( Y / N )
Actual # of pennies: _____	Actual # of pennies: _____	Actual # of pennies: _____

# PENNY BOAT CHALLENGE

(continued)

## After the competition:

- My most successful boat held \_\_\_\_\_ pennies.
- If each penny had the mass of 2.5 grams<sup>\*</sup>, my most successful boat held \_\_\_\_\_ grams total.
- The **independent variable** is what you changed in the experiment: What is the independent variable? \_\_\_\_\_
- The **dependent variable** is what changed as a result of your boat design: What is the dependent variable? \_\_\_\_\_
- **Constants** are things that remained the same through each trial. Think of two things that remained the same for each boat:  
\_\_\_\_\_, \_\_\_\_\_
- What are steps do scientists' use in making experiments? (remember PRHEAC?)  
\_\_\_\_\_  
Did we use all the steps? \_\_\_\_\_

**Reflection/ Conclusion:** Write about the strategies you used to solve this problem. What worked, what didn't and what would you change if you did this again?

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