

**Activity 2.4 Clean Sweep: Sink or Swim**

**Introduction**

***Scientific Inquiry: Guiding Question – What characteristics of mass and volume have an effect on buoyancy?***

**Lesson Objectives:**

At the end of this lesson, you will be able to:

1. Predict buoyancy of an object using mathematics and predictive analysis.

**Equipment**

* Large plastic tub
* Golf balls
* Aluminum foil

**Procedure**

Working with your Clean Sweep group, complete the following steps to complete the design challenge concerning buoyancy of objects.



1. Observe the shape of the following ships. Why do the ships have different shapes?

|  |  |
| --- | --- |
| Image result for ships | Image result for ships |
| Image result for barge | Image result for cruise ship |

1. Sinking and Floating quiz. Which person will likely float?

|  |  |
| --- | --- |
| **Condition** | **Reason** |
| Child versus Adult |  |
| Adult versus Elder |  |
| Man versus Woman |  |
| Fat guy versus Thin guy |  |

**Raft Design Challenge**

**Preface**: The manufacturing company Riff-Raft seeks to create a new line of emergency rafts that are portable for hikers. Your task is to create a prototype of the raft using given materials. As an engineer, you have to report out the anticipated capacity of the raft before testing it out.

Challenges

1. Build a raft using a sheet of aluminum foil (40 x 30 cm)
2. The raft should load at least 30 golf balls on water before submerging
3. Predict critical load (total number of golf balls)
4. Size: Less than 30 x 25 cm
5. Time limit: 10 minutes

\*Hint: Weight of golf ball: 46g

**Results**

***Estimated capacity:***

|  |  |
| --- | --- |
| *Number of golf balls* | *Total weight (N of golf balls \* 46g)* |
|  |  |

***Measured capacity:***

|  |  |
| --- | --- |
| *Number of golf balls* | *Total weight (N of golf balls \* 46g)* |
|  |  |

**Redesign the Riff-Raft prototype**

**Challenges**

1. Rebuild a raft using the STEM knowledge and given materials.
* Sheet of aluminum foil (40 x 30 cm)
1. Calculate the minimum volume of the raft to hold 30 golf balls.
2. Time limit: 20 minutes

**Your Design**

1. Calculate the volume of your raft that is capable to hold 30 golf balls.
2. Draw your design:

|  |
| --- |
|  |

**Results**

|  |  |
| --- | --- |
| The volume of the raft | Number of golf balls |
|  |  |

**Reflection**

1. What knowledge did you use to build your raft design?
2. In general, how does knowledge of STEM concepts benefit you in the design of a raft?