NAVSEA
SCIENCE, TECHNOLOGY, ENGINEERING & MATHEMATICS

#SeaworthySTEM

Film Canister Boat Float

Grades 6-8

Student Activity Workbook

Name: _____

Date: _____

Seaworthy STEM™ in a Box Series

NAVSEA
SCIENCE, TECHNOLOGY, ENGINEERING & MATHEMATICS

NAVAL STEM
SCIENCE · TECHNOLOGY · ENGINEERING · MATHEMATICS

Office of Naval Research
ONR
Science & Technology

Film Canister Boat Float

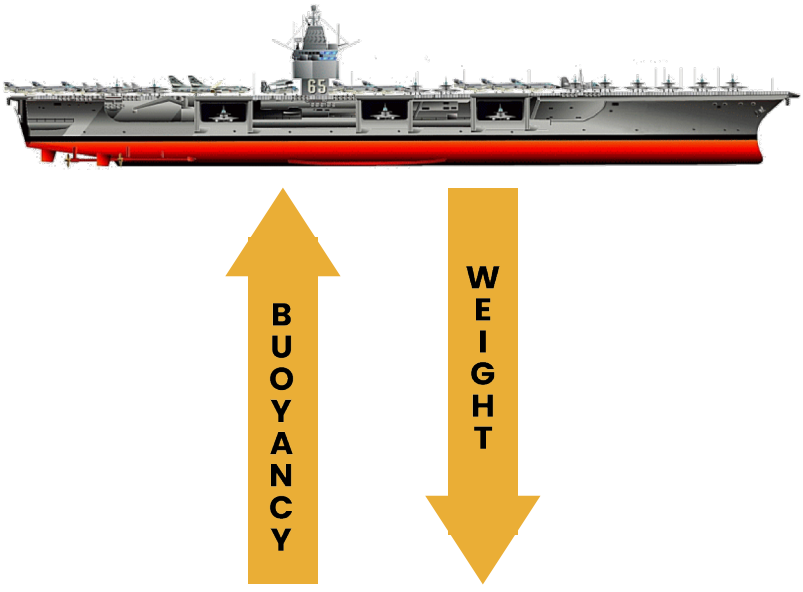
Your Goal: Build the heaviest boat that still floats in water.

Materials:

- Film canister
- Sand
- Ruler

Some possibly useful information about floating boats...

- The water applies an upward buoyant force equal to the weight of the boat.
- The water's buoyant force is equal to the weight of the water that the boat displaces.
  - ↳ So the hull of a 50 Newton boat displaces 50 Newtons of water.
- Weight and mass are proportional – so these forces can be related to masses.
  - ↳ Meaning a 5000 g boat displaces 5000 g of water.
- Also... water's density is approximately 1 gram per cubic centimeter.
  - ↳ So our 5000g of displaced water takes up 500 ml of volume.



Film Canister Boat Float Challenge!

Which group can fill their canister with the most sand and still have it float?

Objective: We know that the design of a boat will allow it to hold mass without sinking. Fill your film canister with as much sand as you dare. Your goal is to create the heaviest possible film canister (using sand) and still have it float.

1. Put sand into your film canister (Replace the lid)

Find the density of your film canister boat:

Calculate the volume of your container using the formula: $V = \pi \times r^2 \times h$

Record your volume: _____cm

Calculate the mass of your container using the balance

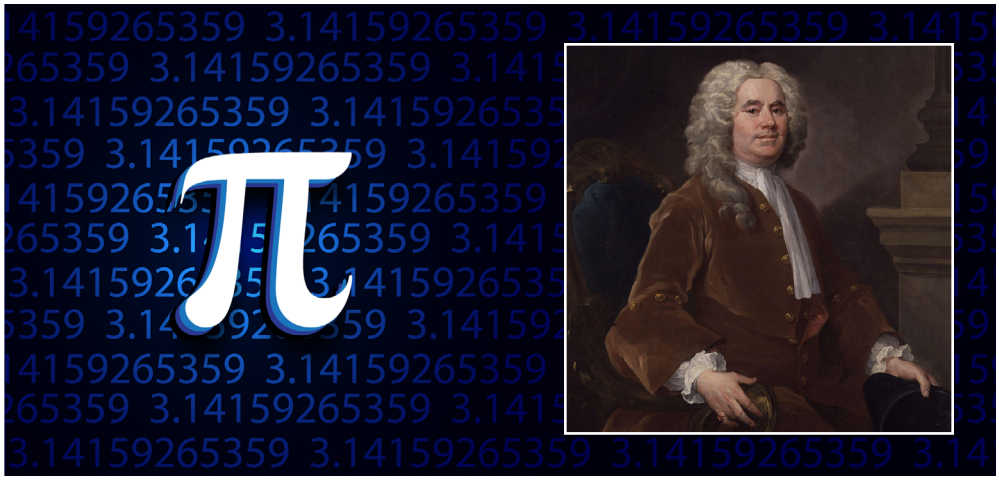
Record your mass: _____g

Calculate the density of your container using the formula: $D = m/v$

Record your density: _____g/cm^3

Fun Fact!

Pi is a variable that represents the ratio of a circle's circumference to its diameter. Pi was devised by British mathematician William Jones in 1706 to represent the ratio and help us understand how a circle's dimensions work.



2 Assuming that the density of your water is 1 g/ml, do you predict that your boat will float or sink? Why?

3 Test your boat.

4 If you were doing this test in salt water, do you think that your boat would be able to hold more, less, or the same amount of sand? Why?

5 **Super Challenge:** Try to get your boat to become a submarine by engineering it to become suspended in the water column. Can you design it to be below the surface while at the same time not touching the bottom?

#SeaworthySTEM

Film Canister Boat Float Engineering Notebook

Seaworthy STEM™ in a Box Series