Will It Float or Sink?

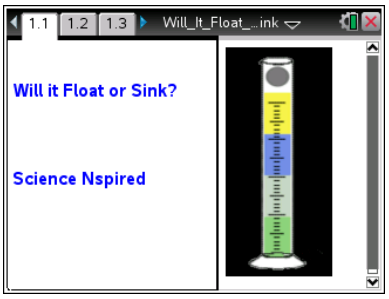
Student Activity

Name _____

Class _____

Open the TI-Nspire document *Will_It_Float_or_Sink.tns.*

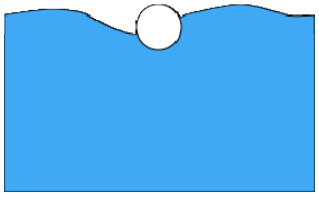
Why do some things float and others sink? Have you ever wondered why ice floats in water? Have you wondered why a rock sinks in water, while polystyrene foam floats? What physical properties make some objects float and others sink? In this activity, you'll use a simulation to explore these questions.



Density is a physical property that indicates whether an object will sink or float. Density is the ratio of an object's mass to its density.

$$Density = \frac{Mass}{Volume}$$

The units for density in this simulation are grams per milliliter, or g/mL. When an object floats on water, then the density of that object is less than that of water.



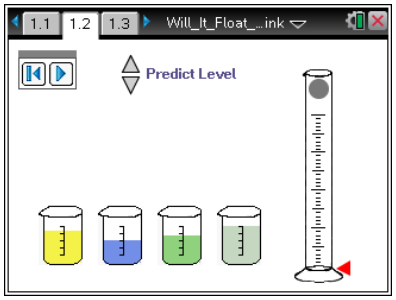
The same idea applies with liquids. If you were to combine oil and water, eventually the layer of oil would collect above the layer of water. This is because oil is less dense than water.

The simulation contains a virtual density column. Four beakers with different liquids (called solutions) of different densities are shown. Your task is to calculate the density of each of the four solutions. Then, based on the results, predict the order in which the layers will settle. Finally, you will predict where a solid object will float when dropped into the column.

Move to pages 1.2–1.3.

Press ctrl ▶ and ctrl ◀ to navigate through the lesson.

1. Move the cursor over a beaker, and you will see the mass and volume measures for a solution. Record this data in the table on the next page.
   a. IMPORTANT: If you click on the beaker, the liquid will be "poured" into the cylinder, forcing you to reset.
   b. When you press the Reset button ⏮, the values for mass and volume change to new values.
   c. You can reset the page using the Reset button ⏮ or the delete button del on the handheld.



Container 1	Container 2	Container 3	Container 4
Mass: _____ Volume: _____	Mass: _____ Volume: _____	Mass: _____ Volume: _____	Mass: _____ Volume: _____

2. Use the *Calculator* page 1.3 or the Scratchpad to calculate the density of each solution.

Q1. What is the formula for calculating density? _____

Container 1	Container 2	Container 3	Container 4
Density: _____	Density: _____	Density: _____	Density: _____

3. Once you have calculated the densities, return to page 1.2 and click on the solution containers in the order in which they will settle in a graduated cylinder.

   If you select an incorrect order, you will "win a Goat". Reset the page and try again.

4. Hover the cursor over the solid ball to reveal the mass and volume.

   Mass: _____ Volume: _____

5. Use the calculator page 1.3 to calculate the density of the solid ball.

   Density of Solid Ball: _____

6. Use the arrows beside "Predict Level" to move the red arrow next to the graduated cylinder to show where you predict the ball will float in the column.

7. Click the play button to watch the ball fall through the density column. If you correctly predicted the location of the ball, you will receive a "Gold Star". If you did not predict the correct location of the ball, you will "win a Goat". Press the Reset button and try again until you receive the Gold Star.

Move to pages 2.1–2.5. Answer questions 2 – 6 below and/or on your handheld.

Q2. When poured into the graduated cylinder, the densest liquid will _____.

A. float on top
B. be the middle layer
C. be the bottom layer
D. mix together

Q3. As the solid becomes denser, it is most likely to _____.

A. sink
B. float
C. rise to the top
D. hang in the middle

Q4. Density is _____.

A. how heavy an object is
B. the size of an object
C. volume divided by mass
D. how closely packed the matter is

Q5. The density of glycerin is 1.26 g/mL. If the mass of glycerin doubles, increasing from 125 g to 250 g, the volume _____.

A. doubles
B. decreases by one-half
C. is unchanged
D. decreases by one-fourth

Q6. The density of glycerin is 1.26 g/mL. If the mass of glycerin doubles, increasing from 125 g to 250 g, the density _____.

A. doubles
B. decreases by one-half
C. is unchanged
D. decreases by one-fourth