Density of Objects

Purpose

1. Determine the mass, volume, and density of objects made from various materials.
2. Compare density across materials.
3. Use iSENSE to visualize and explore object properties and measurement variability.

Materials

1. Small objects to measure
2. Graduated cylinder (preferably in mL)
3. Scale (preferably in grams)
4. Water source and extra container
5. Computer or tablet with internet connection

Method

1. Divide into groups and gather materials (multiple items of the same type can be measured simultaneously — e.g. your "object" could be "4 washers").
2. Select an object and describe it in Table 1 (object type).
3. Measure and record the object mass.
4. Measure the volume of your object.
   a. Fill the graduated cylinder with enough water to submerge your object without overflowing. Note the original volume on scratch paper. (Hint: Fill to a round number of mL to simplify calculations.)
   b. Carefully submerge the object and tap the graduated cylinder to remove bubbles.
   c. Note the new volume. Record the volume of your object (new volume minus original volume) in Table 1.
5. Calculate the density by dividing mass by volume. Record density in Table 1.

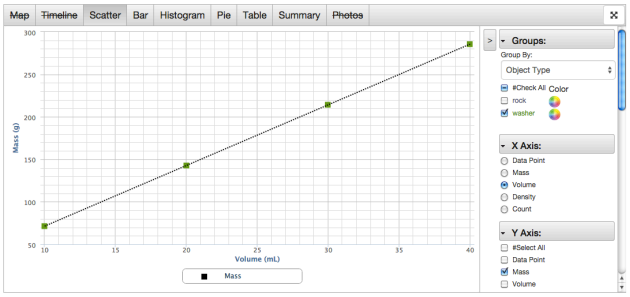
Mass (g)	Volume (mL)	Density (g/mL)	Object Type

Table 1

6. Repeat steps 2–5 for other objects.
7. Enter your data from Table 1 into iSENSE.
   - Go to www.isenseproject.org
   - Login as directed by your teacher.
   - Click on *Project* and search for *Density of Objects* or *709*.
   - Click on *Manual Entry* under *Contribute Data*.
   - Enter a data set name (e.g. partners' first names).
   - Enter data. Use "Add Row" as necessary. Then click *Save*.

iSENSE Analysis

1. Verify correct input of your data in *Table*.
2. Use the *Scatter* plot with volume on the X axis and mass on the Y axis.
3. *Group* the data by *Object Type* and examine the scatter plots for different objects.
4. Enable data for one *Object Type* only, and draw a linear *Best Fit Line*.
5. Mouse over the line to see the slope.
6. Explore your data together with others' data.
7. Save any visualization that you find interesting.



Discussion Questions

1. How do the densities of different materials compare to each other?
2. How does the slope of the line from Analysis Step 5 relate to the density of an object?
3. What questions might you investigate if you were to repeat this experiment?

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