<div style="background:red;color:white">**WORKSHEET: DENSITY FUNDAMENTALS**</div>

Density is the ratio of mass to volume. Put another way, **density** equals mass divided by volume. **Density** can be measured in grams per cubic centimeter (g/cm^3), or in other units of mass and volume.

The **density** of a substance doesn't depend on the size of an object made of that substance any more than the color of the substance does. For example, the four blocks of gold below all have different masses, and they all have different volumes. But they all have the same **density** (not to mention the same color):
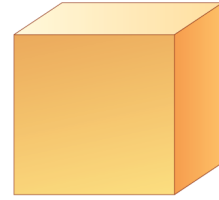
mass: 9.65g
volume: 0.5cm^3

mass: 19.3g
volume: 1cm^3

mass: 38.6g
volume: 2cm^3

mass: 154.4g
volume: 8cm^3

What is the **density** of gold? To find out, divide the mass of each block by its volume:

9.65g/0.5cm^3 = _____ g/cm^3

19.3g/cm^3 = _____ g/cm^3

38.6g/2cm^3 = _____ g/cm^3

154.4g/8cm^3 = _____ g/cm^3

The second one, with no number in front of the cm^3, might have seemed either pretty obvious or pretty tricky to you. When you just have a unit like cm^3 in an expression like 19.3g/cm^3, it means **one** cm^3 (not zero cm^3!). This expression shows the "unit rate," which means it tells you how many grams there are per **one** cubic centimeter. That's what we use to describe the **density** of gold, and you can see by doing the math that it's the same for all four gold objects. They all have the same ratio of mass to volume.

Density helps us compare different substances—not just different *objects*, but the *substances* of which objects are made. Consider the block of gold on the left below, with a volume of 8cm^3 and a mass of 154.4g, and the block of pine wood on the right, with a volume of 63cm^3 and a mass of 25.2g. Just comparing the mass 154.4g to the mass 25.2g doesn't really get at the difference between these two substances, because the particular objects we're comparing are different sizes. But the **density** of the two substances tells us something essential about gold and pine wood, something that doesn't depend on the sizes of the objects. To compare the **density** of two materials, you consider pieces of each material with the same volume, and compare their masses. To do this without actually chopping pieces out of objects, you divide the mass of each object by its volume.

Find the **densities** of gold and pine below:

154.4g/8cm^3

_____g/cm^3

_____g/cm^3

25.2g/63cm^3