

Handout 4: Don't Be So Dense

Answers

1. What is density? What units is density in?
Density is a ratio of mass per volume. It can be in units of kilograms per liter, grams per cubic centimeter, pounds per cubic foot, etc.
2. Explain Cavalieri's principle. What does it tell us?
Cavalieri's principle says that as long as two solids have the same height and cross-sectional area, their volumes will be the same.
3. A cylindrical cup of water has a circumference of 8 centimeters and a height of 12 centimeters. If the amount of water in the cup weighs 61.1 grams, what is the density of water?
1 gram per cubic centimeter
4. The mass of a single dumbbell needs to be 25 pounds. If its volume is 32.4 cubic centimeters, how dense should the material be?
0.77 pounds per cubic centimeter
5. The density of lead is about 11 grams per cubic centimeter. How much volume does 490 grams of lead take up? If the volume were to be contained in a sphere, what would be the length of the radius?
 $V \approx 44.5 \text{ cm}^3$, $r \approx 2.2 \text{ cm}$
6. A brain weighs about 48 ounces and takes up 1200 cubic centimeters of volume. What is the brain's approximate density in ounces per cubic centimeter?
0.04 ounces per cubic centimeter
7. A cylinder with a radius of 2 centimeters weighs 16 grams. If the density of the cylinder is 0.4 grams per cubic centimeter, how tall is the cylinder?
3.2 centimeters tall
8. A pyramid made of wood has a density of 0.9 grams per cubic centimeter and weighs 340 grams. If it has a square base and a height of 20 centimeters, what is the surface area of the pyramid?
 360.8 cm^2
9. An orange weighs about 200 grams. If its radius is about 4 centimeters, what is the average density of the orange?
0.75 grams per cubic centimeter
10. A hemisphere with a radius of 13 inches has had a cone with radius 13 inches and a height of 13 inches hollowed out of it. The solid weighs 1 kilogram. If 1 kilogram is 1000 grams, what is its density in grams per cubic inch?
0.43 grams per cubic inch