

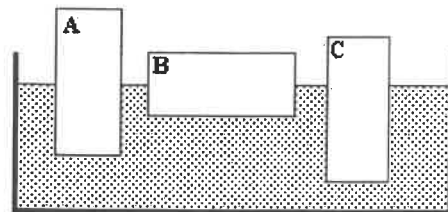
$$\text{ave.} = 6.8$$

$$\sigma = 2.4$$

**Quiz #7: Fluids**

**Problem 1 (2 points)**

Three blocks labeled A, B, and C are floating in water as shown in the drawing. Blocks A and B have the same mass and volume. Block C has the same volume, but is submerged to a greater depth than the other two blocks. Which of the following statements concerning this situation is **false**?



- a) The density of block A is less than that of block C.
- b) The volume of water displaced by block C is greater than that displaced by block B.
- c) The buoyant force acting on block C is greater than that acting on block B.
- d) The volume of water displaced by block A is greater than that displaced by block B.
- e) Two of the above.

**Problem 2 (4 points)**

An object weighs 50.0 N when weighed in air and 37.5 N when completely submerged in water. What is the density of the object?

$$F_B = 50.0 \text{ N} - 37.5 \text{ N} = \underline{12.5 \text{ N}}$$

$$m = w/g = \frac{50.0 \text{ N}}{9.80 \text{ m/s}^2} = \underline{5.10 \text{ kg}}$$

$$F_B = \rho_{\text{fluid}} V_{\text{sub}} g = \rho_{\text{fluid}} V_{\text{obj}} g$$

$$\rho = \frac{m}{V} = \frac{5.10 \text{ kg}}{1.28 \times 10^{-3} \text{ m}^3}$$

$$V_{\text{obj}} = \frac{F_B}{\rho_{\text{fluid}} g} = \frac{12.5 \text{ N}}{(1000 \text{ kg/m}^3)(9.80 \text{ m/s}^2)}$$

$$= \underline{1.28 \times 10^{-3} \text{ m}^3}$$

$$\rho = \underline{4.0 \times 10^3 \text{ kg/m}^3}$$

**Problem 3 (4 points)**

A car drives off a country bridge and ends up at the bottom of a lake. The car door is rectangular with dimensions 0.80 m by 1.20 m and is at an (average) depth of 4.50 m. How much force does the water exert on the car door?

$$P = P_0 + \rho g d = P_{\text{atm}} + \rho g d$$

$$P = 1.013 \times 10^5 \text{ Pa} + (1000 \text{ kg/m}^3)(9.80 \text{ m/s}^2)(4.50 \text{ m}) = 1.45 \times 10^5 \text{ Pa}$$

$$F = PA = (1.45 \times 10^5 \text{ Pa})(0.80 \text{ m} \times 1.20 \text{ m})$$

$$F = \underline{1.40 \times 10^5 \text{ N}}$$