

AActivity**Fluid Forces**

Solve the following problems. Show all your work. Remember to include the correct units.

1. What is the pressure applied by a piston that has an area of 10 cm^2 and exerts a force of 10 N ?

$$P = \frac{F}{A} = \frac{10 \text{ N}}{10 \text{ cm}^2} = \boxed{1 \text{ N/cm}^2 \text{ or } P_0}$$

2. A 0.7-kg mass measures 5 cm in width, 10 cm in length, and 2 cm in height. It is resting on a wooden floor.

$$\textcircled{1} A = 5 \times 10 = 50 \text{ cm}^2$$

- a. What pressure does it exert on the floor?

$$\textcircled{2} F = m$$

$$(0.7 \text{ kg})(9.8 \text{ m/s}^2) = 6.86 \text{ N}$$

$$\textcircled{3} P = \frac{F}{A} = \frac{6.86}{50 \text{ cm}^2} = \boxed{0.14 \text{ N/cm}^2}$$

- b. If it is turned so that the 5-cm and 2-cm sides are in contact with the floor, will the pressure on the floor be increased or decreased?

$$P = \frac{F}{A} = \frac{6.86 \text{ N}}{10 \text{ cm}^2} = \boxed{0.69 \text{ N/cm}^2 \text{ increased}}$$

3. What volume will a gas occupy at 975 mm of pressure if the gas occupies 525 cc at 650 mm of pressure?

$$P_1 V_1 = P_2 V_2 \rightarrow (975)(x) = (525)(650)$$

$$975x = 341250 \quad \boxed{1x = 350 \text{ cm}^3}$$

4. A container with equal sides of 10 cm is filled with 500 g of fluid.

- a. What is the force in newtons on the bottom of the container?

$$F = ma \rightarrow (0.5 \text{ kg})(9.8 \text{ m/s}^2) = \boxed{4.9 \text{ N}}$$

- b. What is the density of the fluid in grams per cubic centimeter?

$$D = \frac{M}{V} = \frac{500 \text{ g}}{1000 \text{ cm}^3} = \boxed{0.5 \text{ g/cm}^3}$$

- c. What is the pressure on the bottom of the container in newtons per square centimeter?

$$P = \frac{F}{A} = \frac{4.9 \text{ N}}{100 \text{ cm}^2} = \boxed{0.049 \text{ N/cm}^2}$$

$$A = l \times w = 100 \text{ cm}^2$$