LESSON MAKER PRO

Pressure Under Pressure

Use force, area, and density to solve pressure problems.

HIGH SCHOOL · P.4.b

P.4.b "Use and solve algebraic formulas to determine the relationships between pressure, force, area, and density."

NAME _____ DATE _____

TWO PRESSURE FORMULAS

Pressure from a force spread over an area is P = F/A, where 1 Pa = 1 N/m^2. In a still liquid, the pressure added by depth h is P = rho × g × h, where rho is density. Use g = 10 m/s^2 for this sheet, and rearrange the formulas to find missing values.

WORKED EXAMPLE

A cart presses on a platform with a force of 84 N over an area of 0.12 m^2. What pressure does it apply?

1. Start with P = F/A.
2. Substitute: P = 84 N / 0.12 m^2.
3. Divide: P = 700 N/m^2.

Answer: 700 Pa

PRACTICE 6 problems

1 A force of 120 N acts over 0.4 m^2. Find the pressure.

ANSWER _____

2 A pressure of 240 Pa acts over 0.5 m^2. Find the force.

ANSWER _____

3 A force of 900 N produces a pressure of 450 Pa. Find the area.

ANSWER _____

4 At a depth of 0.75 m, a liquid adds 6,000 Pa of pressure. Find the liquid's density.

ANSWER _____

5 A liquid has a density of 1,000 kg/m^3. How much pressure does it add at a depth of 2 m?

ANSWER _____

6 A liquid with a density of 1,200 kg/m^3 adds 36,000 Pa of pressure. Find the depth.

ANSWER _____

APPLY IT Show your work

1 At a skate park, a rider pushes on a landing pad with a force of 540 N over an area of 0.03 m^2. If the same force spreads over 0.06 m^2, what is the pressure in each case? Which area gives the lower pressure?

WORK SPACE

ANSWER _____

2 An aquarium open to the atmosphere has a horizontal viewing panel in its floor, 1.5 m below the water surface. The panel has an area of 0.04 m^2, and air at atmospheric pressure is beneath it. Water has a density of 1,000 kg/m^3. What is the net pressure on the panel, and what net force does the water exert on it?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A tank open to the atmosphere has a flat horizontal bottom 2 m below the liquid surface. Air at atmospheric pressure is outside the bottom. A sensor measures 16,000 Pa of net pressure on the bottom, which has an area of 0.5 m^2. Find the liquid's density and the net force on the bottom.

WORK SPACE AND ANSWER

Pressure Under Pressure

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A force of 120 N acts over 0.4 m^2. Find the pressure.	**300 Pa**
2	A pressure of 240 Pa acts over 0.5 m^2. Find the force.	**120 N**
3	A force of 900 N produces a pressure of 450 Pa. Find the area.	**2 m^2**
4	At a depth of 0.75 m, a liquid adds 6,000 Pa of pressure. Find the liquid's density.	**800 kg/m^3**
5	A liquid has a density of 1,000 kg/m^3. How much pressure does it add at a depth of 2 m?	**20,000 Pa**
6	A liquid with a density of 1,200 kg/m^3 adds 36,000 Pa of pressure. Find the depth.	**3 m**

PART 2 · APPLY IT

1. **18,000 Pa over 0.03 m^2; 9,000 Pa over 0.06 m^2. The larger area gives the lower pressure.** Divide 540 N by each area. With the force unchanged, doubling the area halves the pressure.
2. **15,000 Pa net pressure; 600 N net force downward** Atmospheric pressure acts on both sides, so the net pressure is 1,000 × 10 × 1.5 = 15,000 Pa. Multiply by 0.04 m^2 to get 600 N.

CHALLENGE

800 kg/m^3; 8,000 N downward

Accept equivalent unit notation. Net pressure in the aquarium and tank problems excludes atmospheric pressure because it acts on both sides.