Name _____ Date _____ Class _____

WORKSHEET
33 **MATH IN SCIENCE: INTEGRATED SCIENCE**

> Multiplication
> Division
> Decimals
> Percentages
> Geometry

The Pressure Is On!

Use math to learn about force and pressure.

You are under pressure! Even though you may not be aware of it, the air above you presses down on every square centimeter of your body with the weight of a 1.03 kg mass! Because water is so much denser than air, pressure in water is many times greater than this. **Pressure** is defined as the force exerted on a particular area. The unit for pressure is the pascal (Pa), which is the force one newton (N) exerts on one square meter (m²).

EQUATION:
$$\text{Pressure (Pa)} = \frac{\text{Force (N)}}{\text{Area (m}^2\text{)}}$$

Apply Some Pressure!

Use the equation for pressure to answer the following questions:

1. An elephant that weighs 40,000 N stands on one leg during a circus performance. The area on the bottom of the elephant's foot is 0.4 m². How much pressure is exerted on the elephant's foot?

_____

2. A carpenter hammers a nail with a force of 45 N with every stroke. The head of the nail has a surface area of 0.002 m². How much pressure is exerted on the nailhead with each stroke?

_____

3. A brick falls from the third floor of a construction site. The brick hits the ground on its end, which measures 0.15 m by 0.25 m, with a force of 30 N. How much pressure is exerted by the brick on the ground? (Hint: Area of a rectangle = width × length)

_____

_____

Pressure in the Atmosphere

The air pressure we live under is about 101,000 Pa at sea level. Use this value to complete the following problems. Show all your work.

4. A mountain climber climbs to the top of Mt. Everest, which at 8848 m is the highest point on Earth. Because most of the air in the atmosphere is below this altitude, air pressure is about 50% less at the peak than at sea level. What is the air pressure exerted on the mountain climber?

_____

5. A meteorologist reports that air pressure is reduced 8,585 Pa by an approaching hurricane. What percentage change from normal air pressure does this represent?

_____

The Pressure Is On! continued

Water pressure increases approximately 10,000 Pa for every 1 m of depth. That means that the pressure at the bottom of a swimming pool that is 10 m deep is almost as great as the pressure exerted by the entire atmosphere!

6. Use what you know about water pressure to complete the chart.

Water Pressure at Various Depths

Depth (m)	1	2	7.5	100	500	1500
Water pressure (Pa)	10,000	20,000				

7. A sea turtle swims from a depth of 45 m to a depth of 28 m. What is the difference in water pressure between these two depths?

_____

_____

8. Deep Submergence Rescue Vehicles (DSRVs) can operate at depths of 4500 m.

   a. If a DSRV with a surface area of 16 m² goes to this depth, what is the total force on the entire hull of the sub?

_____

_____

   b. What would be the total force on a DSRV one-quarter that size at one-half that depth?

_____

_____

Challenge Yourself!

9. A magician lies on a bed of nails. The magician weighs 600 N and is supported by exactly 2000 nails. The tip of each nail has an area of 0.0001 m². Assuming that the weight of the magician is evenly distributed on the nails, how much pressure is exerted on each nail by the magician's body?

_____

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