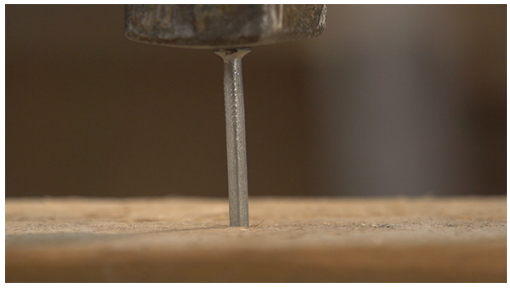
# Grade 8 Science

## Unit 3: Fluids

When you swing a hammer and land your blow on a thick piece of wood, you damage the wood by putting a small dent in it, but the hammer does not go into the wood.

When you repeat the exact same action, placing a nail between the hammer and the wood, the nail is driven into the wood.



Why is there a difference?

# Pressure

| | |
|---|---|
| What is a force? | A push or a pull that can cause movement<br>Measured in Newtons (N) |
| What is pressure? | A force per unit of area<br>Measured in Pascals (Pa) |
| What is a Pascal? | A Pascal is defined as 1 N per $m^2$<br>1 kPa = 1000 Pa |

If pressure is measured in units of $N/m^2$, and the definition is a force per unit area, what would be the equation used to calculate pressure?

force → $\frac{N}{m^2}$ → $Pressure = \frac{Force}{Area}$ ← area

# Pressure

Let's look at an example question:

Nathan shoots a basketball and bricks it off the backboard. As it hits, the ball compresses and 150 $cm^2$ (0.015 $m^2$) of the ball hits the backboard. If the ball hits with a force of 200 N, how much pressure is put on the backboard?

$F = 200\ N$

$A = 0.015\ m^2$ ✓

$P = ?$

* Remember, for pressure it needs to be $m^2$

$P = \frac{F}{A}$ ✓

$P = \frac{200}{0.015}$

$P = 13333.\bar{3}\ Pa$

$P = 13.\bar{3}\ kPa$

∴ There is $13.\bar{3}$ kPa of pressure on the backboard. ✓

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# Pressure

Some questions dealing with pressure will state that there is an object resting on a surface and ask you to determine the pressure on the surface. If you are told the area of the footprint, but instead of being told the force applied by the object you are told the mass of the object, can you still determine the pressure?

The force of gravity applies a force of 9.8 N/kg on all objects.

A 13 kg object has a base that is 1.2 $m^2$. How much pressure does it exert on the ground?

$m = 13\ kg$
$g = 9.8\ N/kg$
$F = ?$

$F = mg$
$F = 13(9.8)$
$F = 127.4\ N$ ✓

$F = 127.4\ N$
$A = 1.2\ m^2$
$P = ?$ ✓

$P = \frac{F}{A}$ ✓
$P = \frac{127.4}{1.2}$
$P = 106.1\bar{6}\ Pa$

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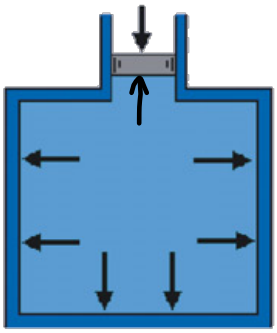
∴ The object applies $106.1\bar{6}$ Pa of pressure on the ground. ✓

# Pascal's Law

Our unit is titled "Fluids," and the pressure we have been discussing has been based on solids. Pressure is exerted in a fluid in the same manner, using the same equation. However, there is a very important property of fluids that makes fluid pressure very useful:

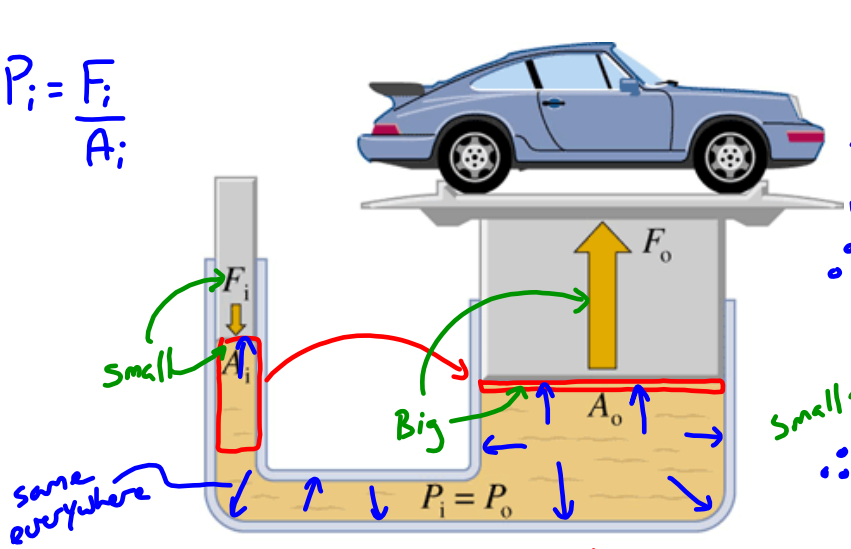
Pascal's Law: Pressure exerted on a fluid is transferred uniformly throughout the fluid.



If the top panel is pressed down it applies a pressure to the fluid under it. That pressure presses equally on all sides of the container.

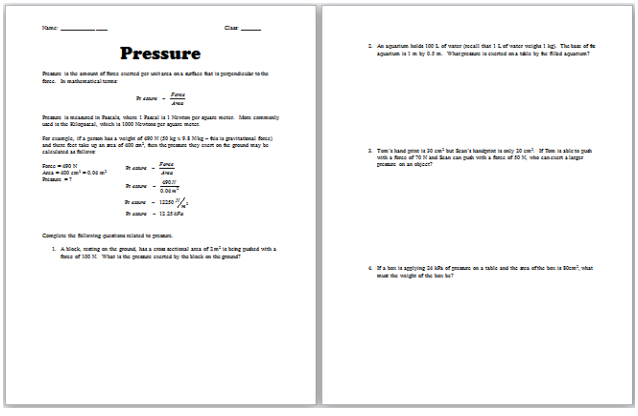
# Pascal's Law

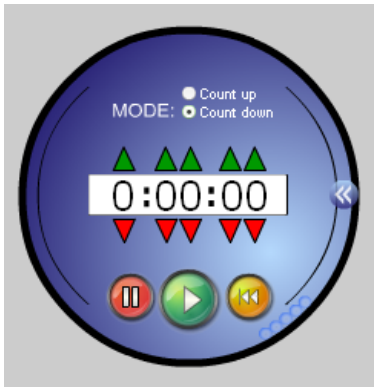
Pascal's Law can be very useful. Have a look at this example:




# Pressure

Please use the remaining time to work on the practice pressure problems I have prepared. Similar to the density problems, there is a good chance you will see a similar question on your unit test.


Pressure



## Attachments

3-13 Pressure.pdf