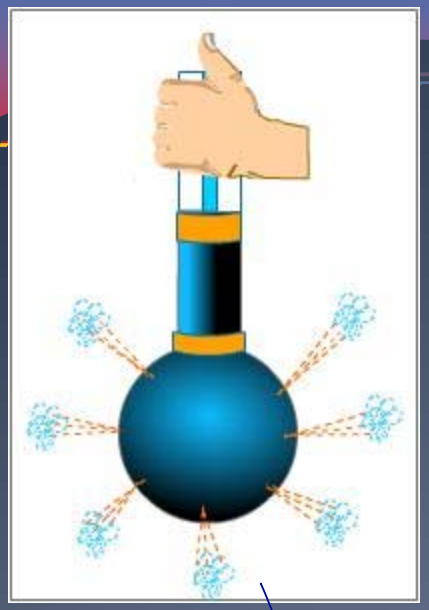


Pascal's Principle

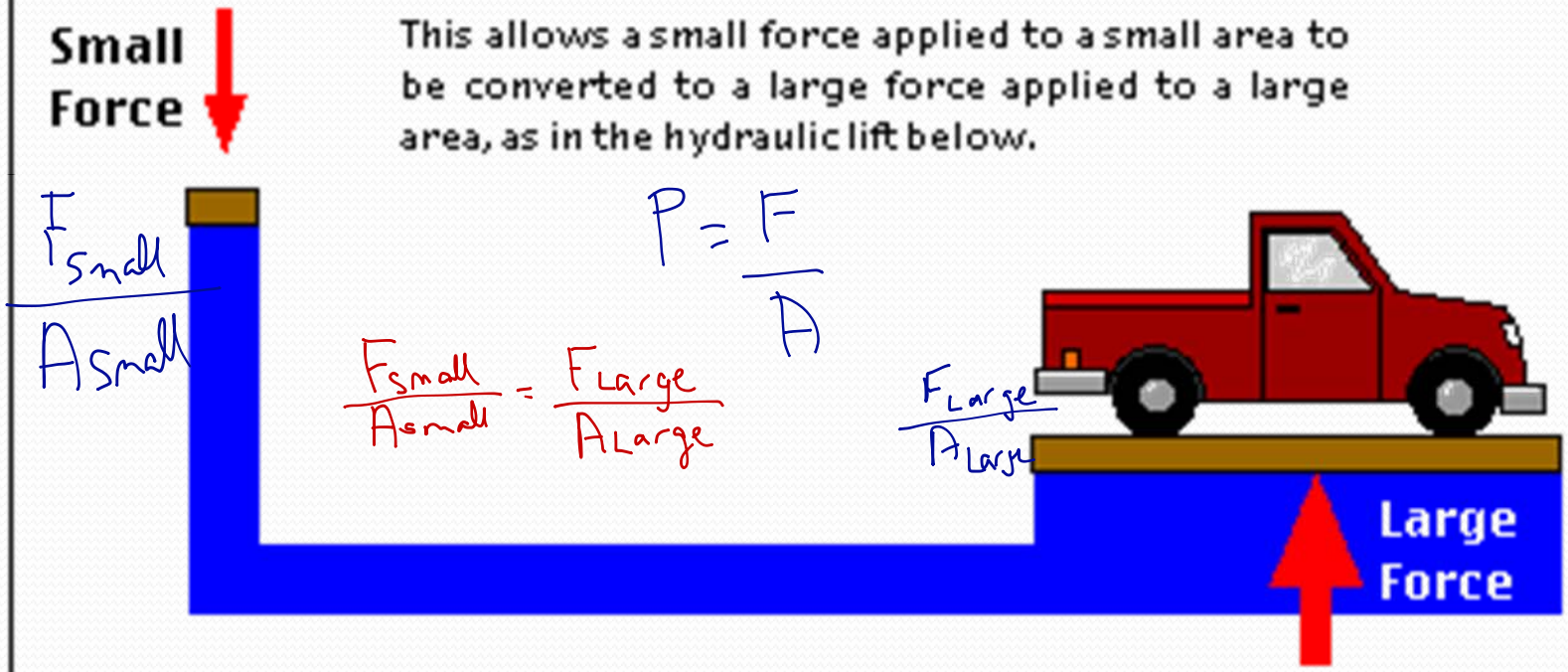
Learning Goals: I will be able to explain Pascal's Principle and its applications.

I will be able to perform calculations with Pascal's Principle.

Pascal's Principle

"The pressure exerted at one surface of an incompressible fluid is equal to the pressure exerted on any other surface."

This allows a small force applied to a small area to be converted to a large force applied to a large area, as in the hydraulic lift below.



Pascal's Equation

- Mathematically:

$$P = \frac{F_1}{A_1} = \frac{F_2}{A_2}$$

- Where F_1 and A_1 are the smaller area and F_2 and A_2 are the larger area.

$$P = \frac{F_{small}}{A_{sml}} = \frac{F_{large}}{A_{large}}$$

Application – Hydraulic Systems

- https://www.youtube.com/watch?v=A3ormYVZMXE
- A car brake system is a hydraulic brake system that makes use of Pascal's Principle. A relatively small force applied to a small piston by the brake's pedal inside the car will produce a large force acting on the brake cylinder (also called the wheel cylinder in the brake assembly) to stop a car quickly.
- Others: syringes, car hoists

#3.

$F_{Large} = 1784\,N$

$A_{large} = 76.32\,cm^2$

$A_{small} = 12.56\,cm^2$

$F_{small} = ?$

$$\frac{F_L}{A_L} = \frac{F_{small}}{A_{small}}$$

$$\frac{(F_L)(A_{small})}{A_L} = F_{small}$$

$$\frac{(1784\,N)(12.56\,cm^2)}{76.32\,cm^2} = F_{small}$$

$$F_{small} = 294\,N$$

#11. $P = \frac{F}{A}$ | $Pa = 1\ \frac{N}{m^2}$

Given: $A = 706.8\ cm^2$. $1m \times 1m = 1m^2$

$0.01m \times 0.01m = 0.0001\ m^2$

↑ 1cm

$A = 706.8 \times 0.0001$

$A = 0.07068\ m^2$

$F = 225\ N$

$P = \frac{F}{A}$

$= \frac{225\ N}{0.07068\ m^2}$

$P = 31\,480\ Pa$

$P = 31.5\ kPa$

Today's Task

- Complete worksheet

Part 1 → Hand in today

Part 2 → Hand in start of class tomorrow.