



# Chapter 7

## Forces in Fluids

### Section 1

#### Fluids and Pressure



# Essential Questions for 7-1

- How do fluids exert pressure?
- How does atmospheric pressure vary with depth?
- How does depth and density affect water pressure?



# Fluid Mechanics

- Liquids and gases have the ability to flow - they are called fluids
- There are a variety of “LAWS” that fluids obey



## Pressure

- A measure of the amount of force exerted on a surface area

$$pressure = \frac{force}{area}$$

- The SI unit for pressure is the pascal. 1 pascal (Pa) is the force of one newton on an area of 1 m<sup>2</sup>





# Pressure and Bubbles

- An important property of fluids is that they exert pressure equally in all directions.
- Air blown into a bubble makes the bubble expand in all directions



# Atmospheric Pressure (Air)

- Atmospheric pressure is just the weight of all the air above an area pressing on the surface of the earth
- Atmospheric pressure effects all objects
- Closer to sea level = more atm. pressure
- Higher up (mts.) = less atm. pressure



# Pressure in a Liquid (Water)

- Water pressure is just the weight of all the fluid above an object
- Are you stronger than water pressure?
- In a swimming pool the pressure on your body surface is just the weight of the water above you (plus the air pressure above the water)



# Pressure in a Fluid

- So, fluid pressure is the gravitational force acting on the mass ABOVE you
- The deeper you go in water, the more weight above you and the more pressure



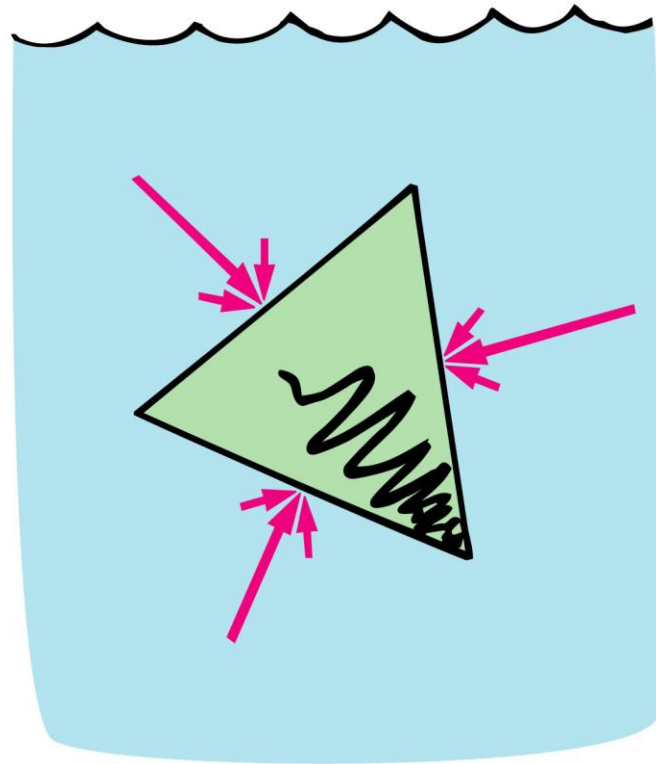


# Density

- Regardless of form (solid, liquid, gas) we can define how much mass is squeezed into a particular space

$$\textit{density} = \frac{\textit{mass}}{\textit{volume}}$$

# Pressure in a Fluid



Pressure acts perpendicular to the surface and increases at greater depth.

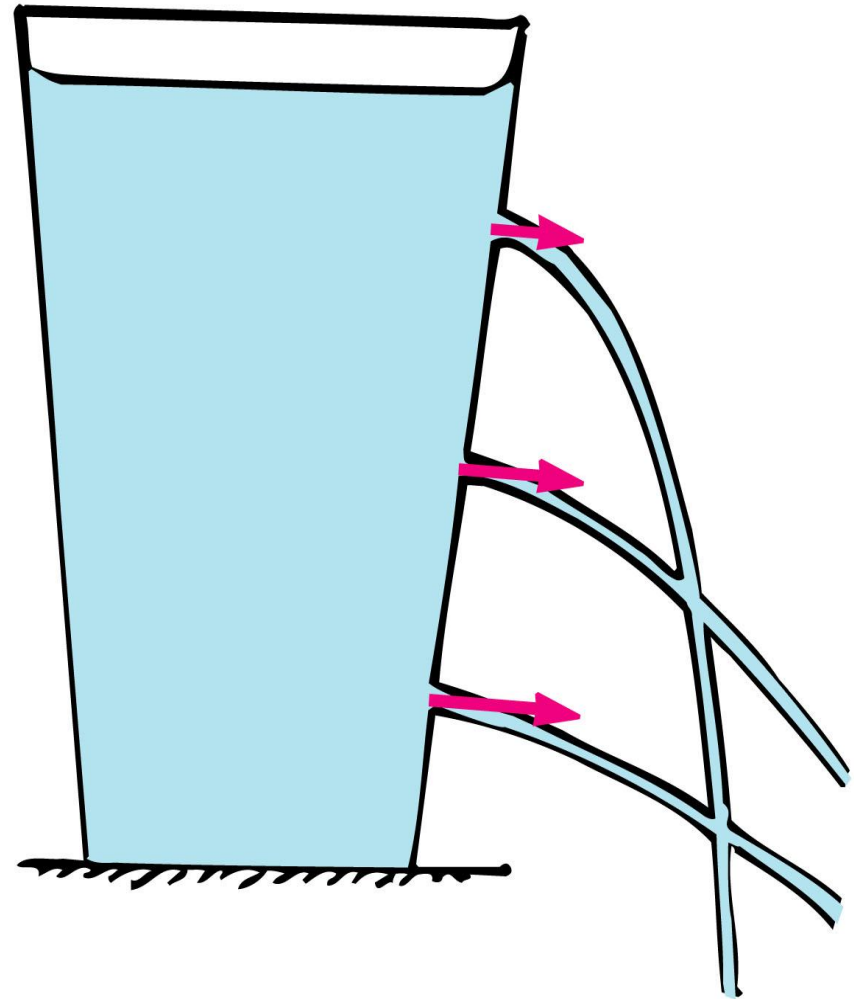
# Pressure in a Fluid


**Deeper the hole  
is in the cup**

=

**More water pressure**

\*This means water  
will spray out farther,  
the lower the hole is\*





# Pressure Differences and Fluid Flow (air or water)

- Fluids flow from the areas of high pressure to areas of low pressure
- Straws work due to air pressure
- The air you inhale and exhale is also flowing from high pressure to low pressure
- Air pressure inside a tornado is very low, so air (and objects) outside the tornado are sucked inside