Fluids & Pressure
Forces in Fluids

Objectives
- Describe how fluids exert pressure.
- Analyze how fluid depth affects pressure.
- Give examples of fluids flowing from high pressure to low pressure.
- State and apply Pascal’s principle.

Vocabulary
- fluid
- pressure
- pascal
- atmospheric pressure
- density
- Pascal’s principle
What is a Fluid?
- Any material that can flow and take the shape of its container.

- Liquids
  - water
  - oil

- Gases
  - CO₂
  - oxygen

What is Pressure?
- Water pressure
- Air pressure
- Blood pressure

The amount of force exerted on a given area.

PRESSURE = FORCE ÷ AREA

Calculate Pressure
Find the pressure exerted by a 1,000 N crate with an area of 5 m².

Pressure = Force ÷ Area
Pressure = 1,000 N ÷ 5 m²
Pressure = 200 N/m²
Pressure = 200 Pa

*Pascal (Pa) is the SI unit for pressure
Calculate Pressure

Find the pressure exerted by a 50 N crate with an area of 2 m².

Pressure = Force ÷ Area
Pressure = 50 N ÷ 2 m²
Pressure = 25 N/m²

Pressure = 25 Pa

Pressure All Around

- Fluids exert pressure equally in every direction.
- That’s why:
  - Bubbles are round
  - Raindrops are round
  - Tire pressure is equal

Atmospheric Pressure

- The pressure caused by the weight of the atmosphere.

At sea level
101.3 kPa
1 atm
760 mmHg
14.69 pounds per square inch
Pressure is “Vary” Different

Mt. Everest – 30 kPa

Siberia – 108 kPa

Pressure Depends on Depth

- The deeper an object in a fluid, the **more** pressure the fluid exerts on the object.
- The shallower an object in a fluid, the **less** pressure the fluid exerts on the object.

Does Amount Count?

No. Pressure does NOT depend on the amount of fluid present but the **depth** of the fluid.

Which is under more pressure?

- A kid swimming in 1 foot of water in the ocean.
- A kid swimming in 9 feet of water in a swimming pool.
More Pressure?

- Fluids with greater density exert more pressure.
- Which exerts more pressure?
  - Air
  - Water
- The answer is water because it is more dense.

What is Density?

- The amount of matter in a certain volume

DENSITY = MASS ÷ VOLUME

Go with the Flow

- All fluids travel from regions of high pressure to regions of low pressure.
- Examples:
  - Straw
  - Lungs
  - Soda bottle w/ paper wad
Pascal’s Principle

- A change in pressure at any point in an enclosed fluid will be transmitted equally to all parts of the fluid.

Examples:
- Water balloon
- Air balloon
- Hydraulics
Hydraulics

- Devices that use liquids to transmit pressure from one point to another.

Examples:
- Vehicle brakes (not air brakes)
- Construction equipment
- Pimpin’

Pimp dat Ride, Yo!

Ride, Yo!

Yo!