Pressure & Depth

- Pressure is a property of a fluid that represents the force/area it would apply to a container (same in every direction)

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

- Pressure increases with depth due to weight of fluid above

$$p = p_0 + \rho g h$$

Density of fluid, m/V

Pressure external to fluid

Buoyancy

- Object in a fluid have an upward force on them due to pressure of fluid being greater on bottom surfaces
- Amount of force happens to be exactly weight of fluid displaced: $F_b = m_{disp} g = \rho V_{disp} g$
- Floating objects: balance between weight of object and buoyant force
  - Can use density of object to determine whether it will float ($m_{obj} = \rho_{obj} V_{obj}$)
  - If so, what fraction of volume is above surface
  - If not, can cancel unknown volumes

Specific Gravity

- Ratios of densities occur frequently in solving problems
- Water is the most common fluid we float things in
  - **Specific gravity**: ratio of some density to that of water (1000 kg/m3) ρ/ρ_{water}
  - Objects float in water if this is less than 1

Moving Fluids

- If an incompressible fluid speeds/up slows down due to a constriction or expansion, its pressure changes

$$p + \frac{1}{2}\rho v^2 + \rho g y = const.$$

same as old piece, except
y is not depth (+ is up!)

- Reason: conservation of energy
  - This equation doesn't work in viscous (friction) fluids

Hurricane Problem

- To finish problem, need to make some unrealistic assumptions:
  - Air enters/leaves house from hurricane through cracks, but none goes around
  - Density of air constant