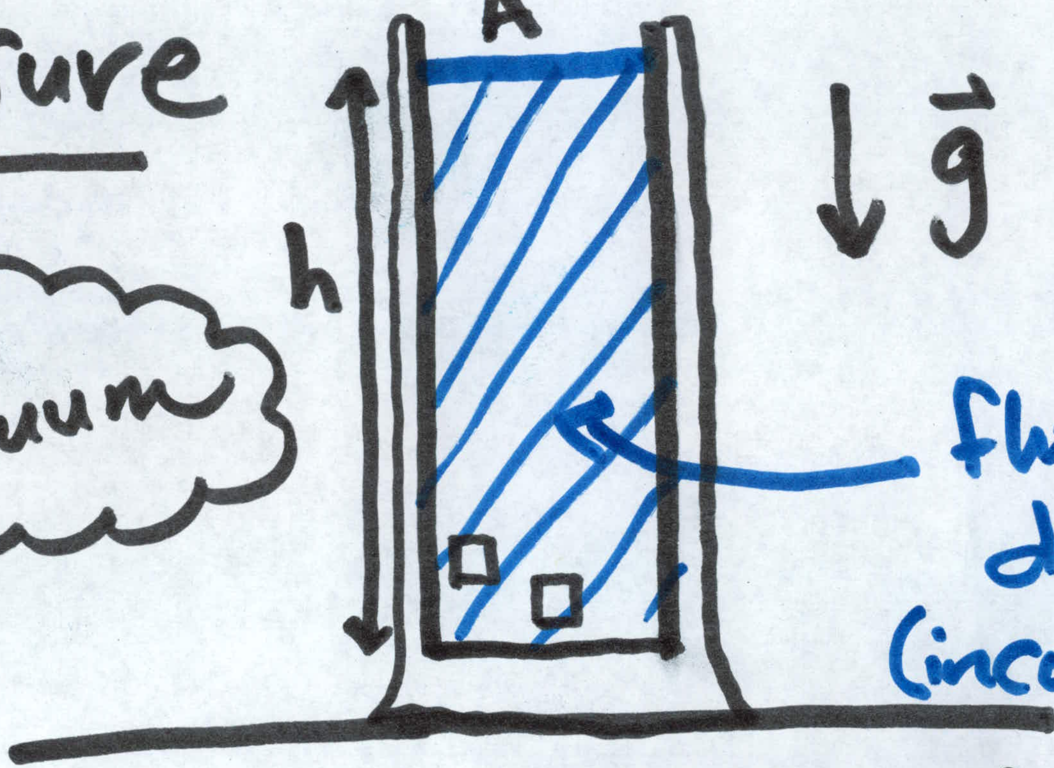
Pressure

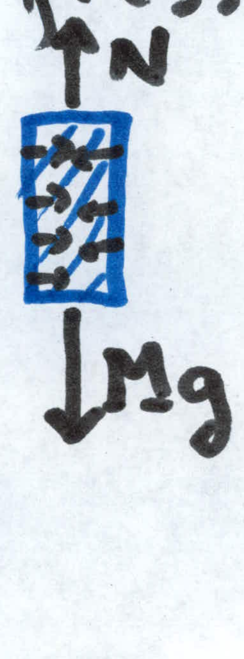
in vacuum



Hg $\rho = 13.5 \frac{g}{cm^3}$

fluid density ρ (incompressible)

what is the pressure X at the bottom?

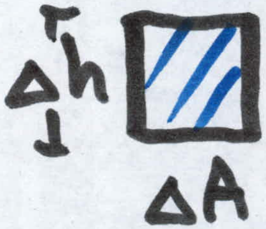


$N = \underline{M} g \quad (\vec{a} = \vec{0})$

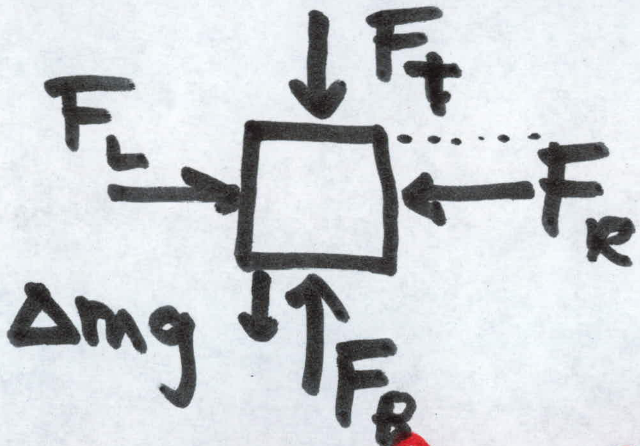
$\underline{M} = \rho \cdot A \cdot h$

$P = \frac{N}{A} = \frac{\rho \cancel{A} h g}{\cancel{A}} = \rho g h$

pressure is an intensive quantity



Small, cubic chunk of incompressible fluid (near the bottom of beaker)



$$\Delta m = \rho \cdot \Delta A \cdot \Delta h$$

$$|\vec{F}_B| = |\vec{F}_T| + |\Delta m \vec{g}|$$

vertical forces

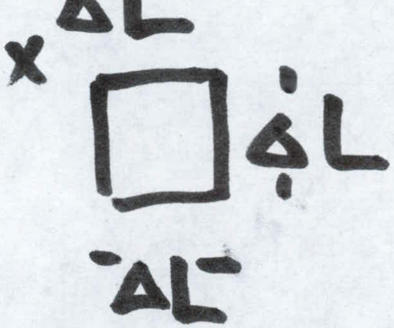
$$P_B \cdot \cancel{\Delta A} = P_T \cdot \cancel{\Delta A} + \underbrace{\Delta m g}_{\rho g \cdot \cancel{\Delta A} \cdot \Delta h}$$

intensive quantities

$$P_B - P_T \equiv \Delta P$$

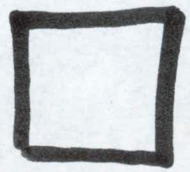
$$\Delta P = g \rho \Delta h$$

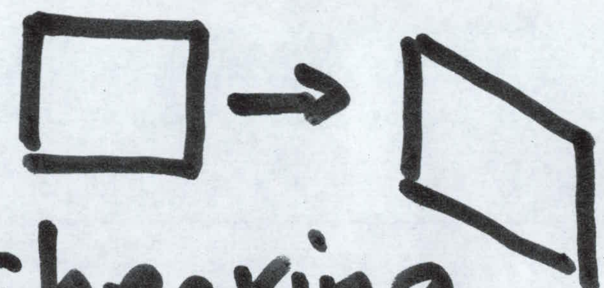
$$\boxed{\frac{\Delta P}{\Delta h} = g\rho}$$



<u>cube</u> of <u>fluid</u>.

→ No shear <u>stresses</u>



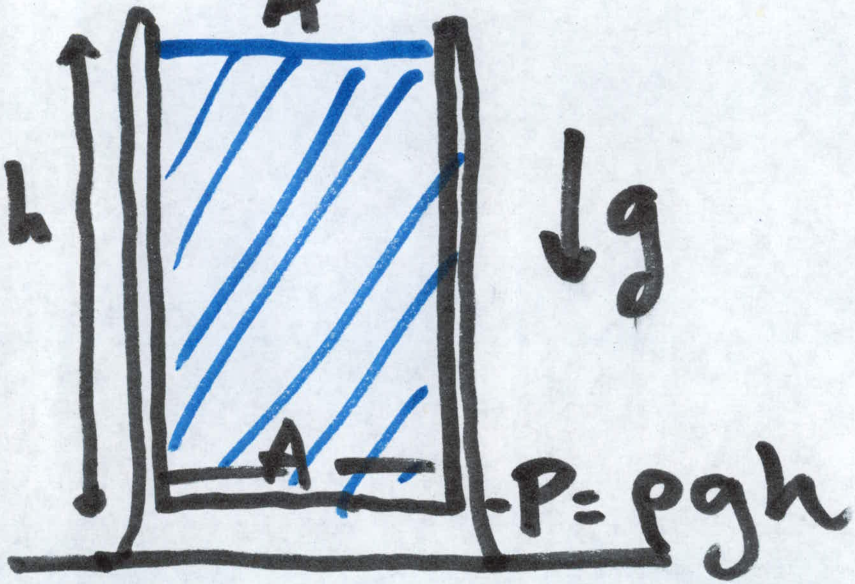


Shearing is <u>easy</u> (arbitrarily)

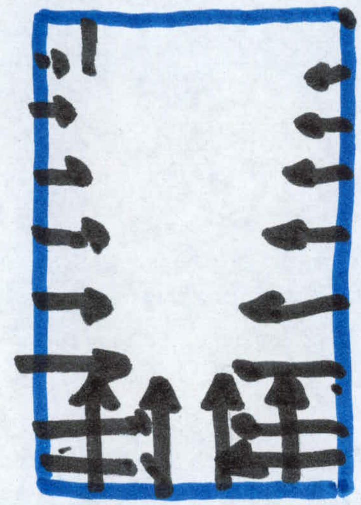
isotropy:
(all other things being equal) the pressure is the <u>same</u> in all directions.

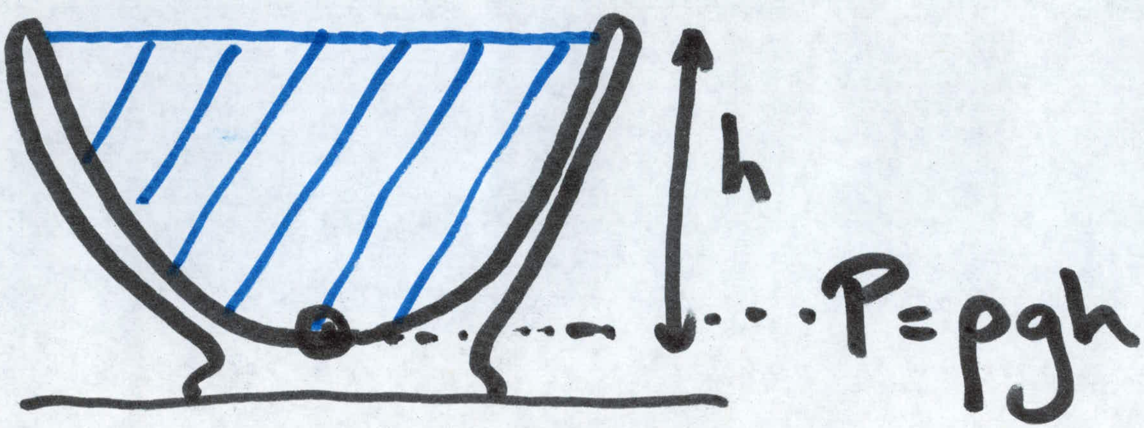
pressure has no direction.

pressure <u>forces</u> are <u>normal</u> to <u>surfaces</u>

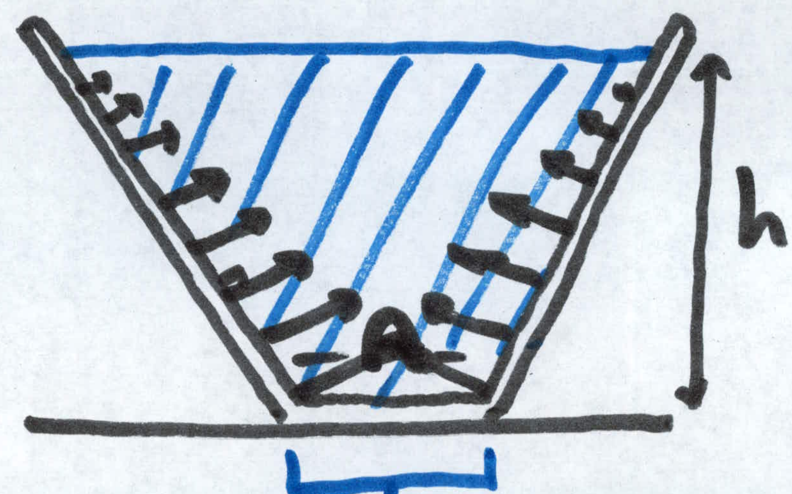


A
h
g
A
$P = \rho g h$





h
$P = \rho g h$



h
A
total force?