FLUID FORCE

Fluid – Conform to their container

$\text{Force} = \rho \cdot A \cdot \text{depth}$

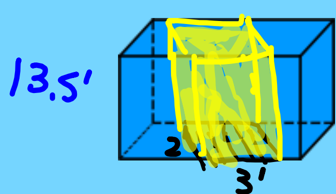
→ Force on a surface

Pressure $\frac{F}{A}$

$= \frac{\rho \cdot \cancel{A} \cdot h}{\cancel{A}}$

Force per unit^2

Force over A



$F: \; 62.4 \frac{lb}{ft^3} \cdot \overset{ft \cdot ft}{(2 \cdot 3)} \cdot 13.5' = 5054.4 \text{ lb.}$

Force

lbs, N,

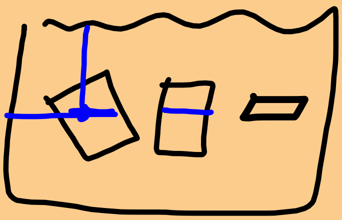
Pressure

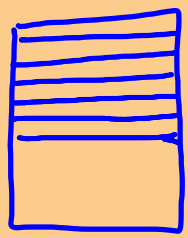
$\frac{N}{m^2}$ = Pascals

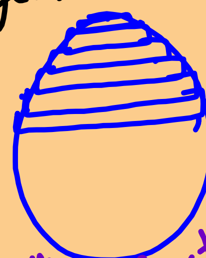
$psi = \frac{lb}{in^2}$

$\frac{lb}{ft^2}$

Pascal's Principle – pressure is the same at any depth regardless of the position of the object







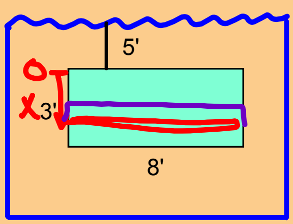
$F = \rho \cdot A \cdot h$

bottom of object

depth of rect. length of rect. width of rect.

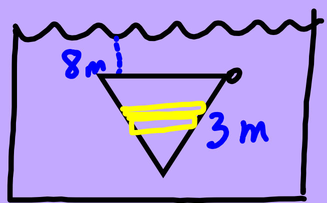
$$F = \int_a^b \rho \, h(x) \, l(x) \cdot dx$$

top of object

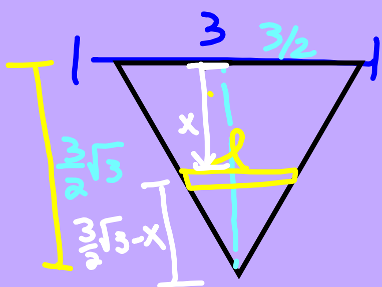


$$\int_0^3 62.4 \cdot (x+5) \cdot 8 \cdot dx$$

$$\approx 9734.4 \text{ lb}$$



$$\int \rho \cdot h(x) \cdot \ell(x)\, dx$$



$$\frac{\ell}{3} = \frac{\frac{3}{2}\sqrt{3} - x}{\frac{3}{2}\sqrt{3}} \qquad = \frac{3\sqrt{3}}{2}$$

$$\ell = \frac{\frac{3}{2}\sqrt{3} - x}{} \cdot \cancel{3} \cdot \frac{2}{\cancel{3}\sqrt{3}}$$

$$\ell = \frac{2}{\sqrt{3}}\left[\frac{3}{2}\sqrt{3} - x\right]$$

$$\int_0^{\frac{3\sqrt{3}}{2}} 9810 \cdot (x+8)\, \frac{2}{\sqrt{3}}\left[\frac{3}{2}\sqrt{3} - x\right] dx$$

$$\approx 339{,}230 \text{ N}$$

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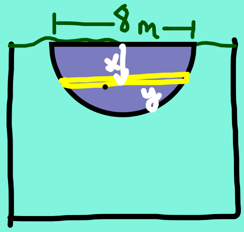

$$\int_a^b \rho \cdot l(x) \cdot \underset{\text{depth}}{h(x)} \; dx$$

$$x^2 + y^2 = r^2$$

$$x^2 + y^2 = 4^2$$

$$\sqrt{y^2} = \pm\sqrt{16 - x^2}$$

$$\int_0^4 9810 \cdot 2\sqrt{16 - x^2} \cdot x \; dx$$

$$= 418{,}560 \text{ N}$$