Develop a Winning Case Strategy

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Pressure function in the fluid $P(x,y,z) = \rho g(H-y)$

$\overrightarrow{dF}$ = Force exerted on the body by the fluid at the infinitesimal surface area $\overrightarrow{dA}$

Let $\overrightarrow{dF_y}$ be the y-component of $\overrightarrow{dF}$ and $\overrightarrow{P} = \rho g(H-y)\hat{j}$

So, $\overrightarrow{dF_y} = -(\overrightarrow{dA}\cdot\overrightarrow{P})\hat{j}$

Magnitude of net buoyant force

$$= \oint_A \|\overrightarrow{dF_y}\|$$
$$= \oint_A -(\overrightarrow{dA}\cdot\overrightarrow{P})$$
$$= \oint_A (-\overrightarrow{P})\cdot\overrightarrow{dA}$$
$$= \oint_V \nabla\cdot(-\overrightarrow{P})d\tau \qquad \text{(Divergence Theorem)}$$
$$= \oint_V (\nabla\cdot(-\rho g(H-y)\hat{j}))d\tau$$
$$= \oint_V (\nabla\cdot(\rho g(y-H)\hat{j}))d\tau$$
$$= \oint_V \rho g d\tau$$
$$= \rho g V = \text{weight of displaced fluid}$$

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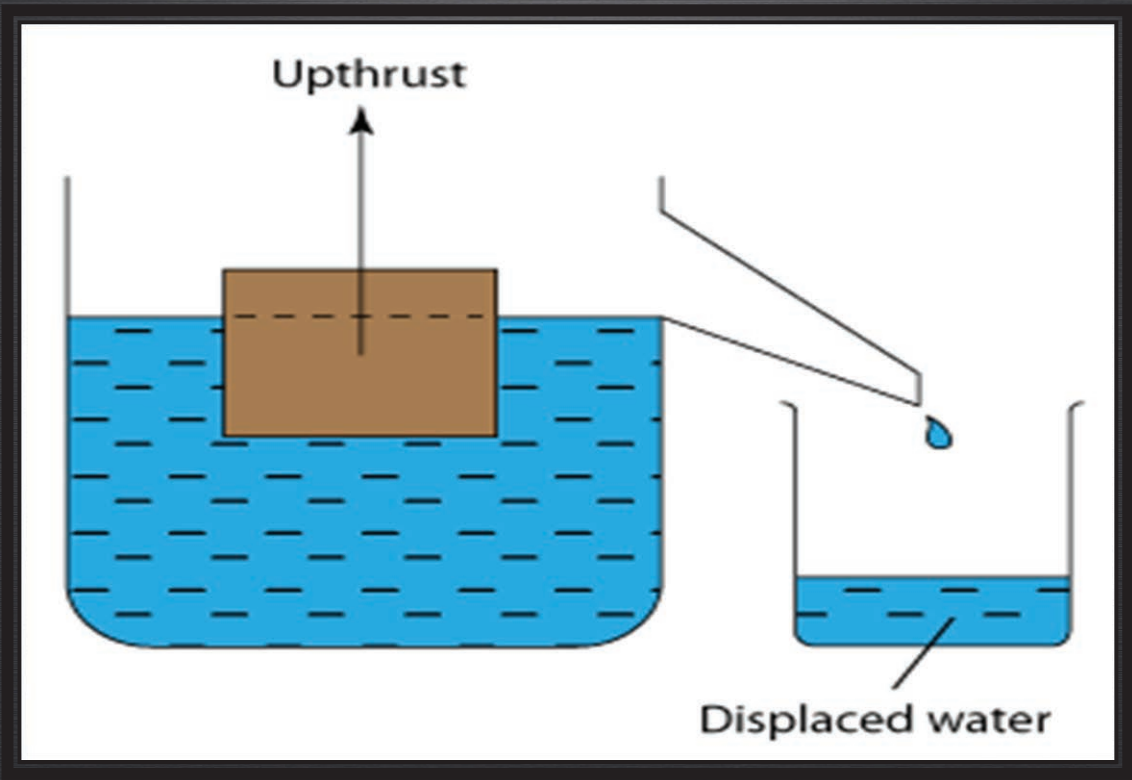

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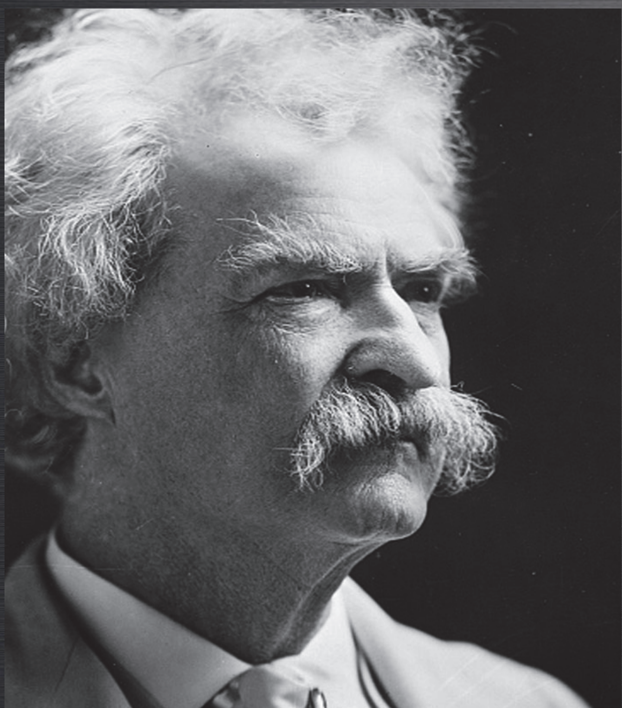

"It is easier to manufacture seven facts than one emotion."

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