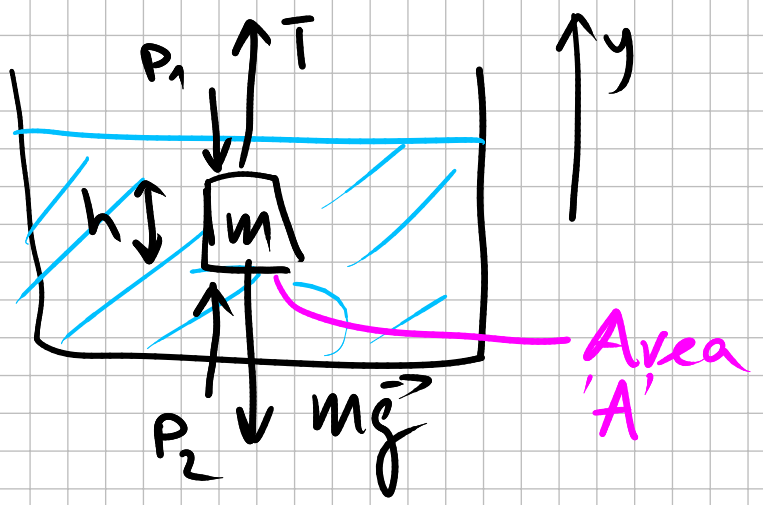
Buoyancy

$$\Sigma \vec{F}_i = 0$$



$$y: \quad T - mg - P_1 \cdot A + P_2 A = 0$$

$$P_2 - P_1 = \rho_f \cdot g \cdot h$$

$$T - mg + \rho_f g h \cdot A = 0$$

$$T = mg - \rho_f g \underbrace{(h \cdot A)}_{V_{submerged}}$$

$F_{Buoyancy}$

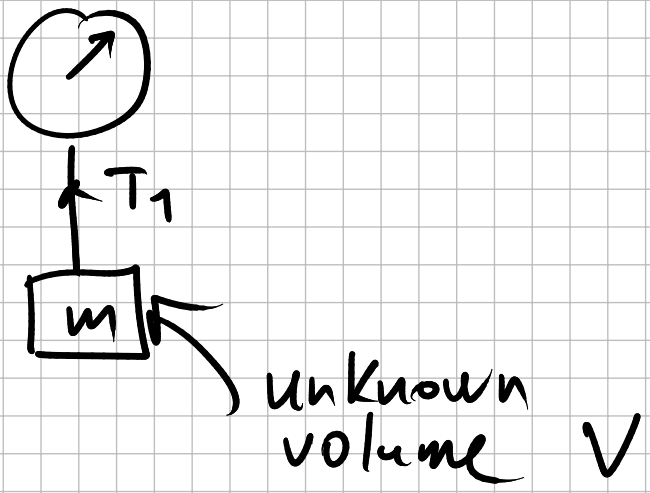
$$\boxed{F_B = \rho_f \cdot g \cdot V_{submerged}}$$

Q: What weights more
1 kg of steel or 1 kg of wood ?

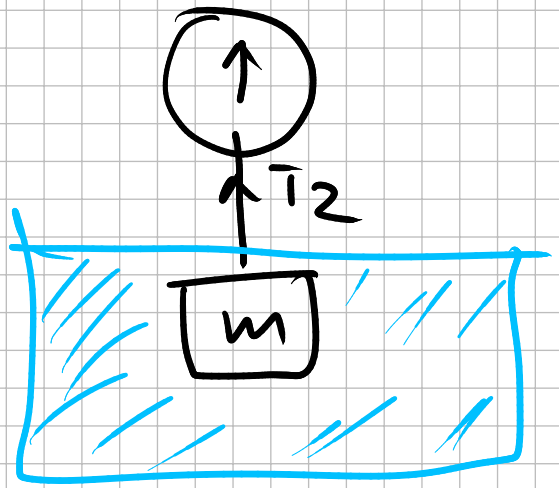
=> steel weights more
b/s of the bougoancy
in the air !

Q: Density of unknown object

1



2.



$$T_1 = mg$$

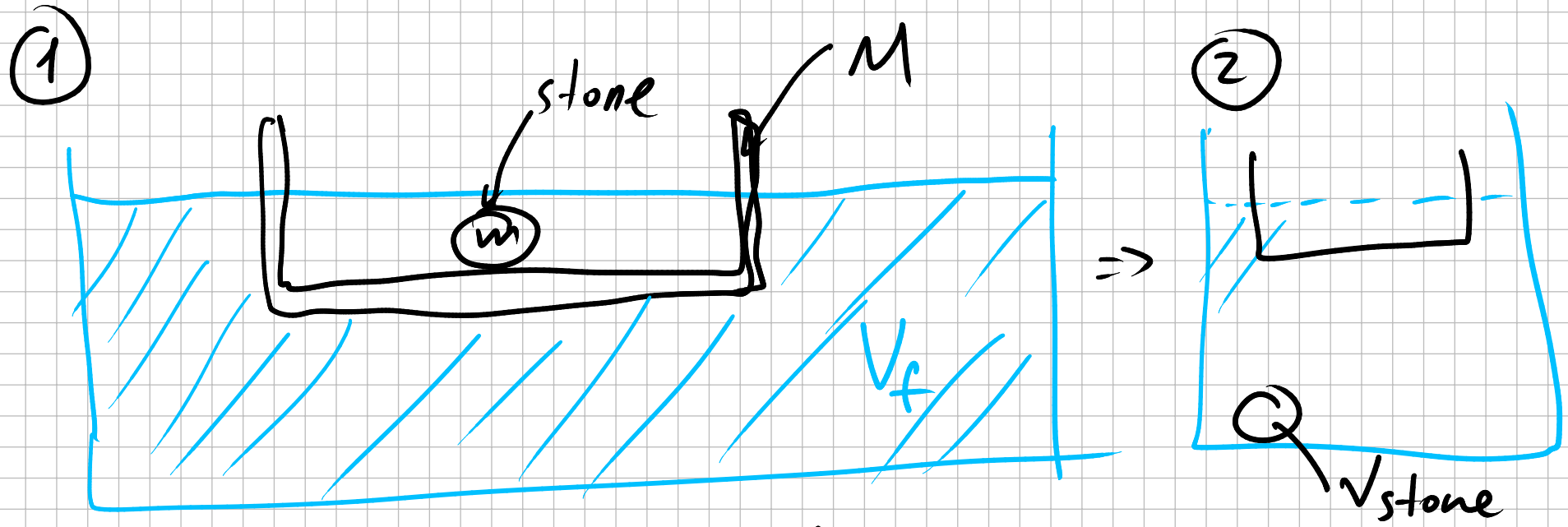
$$T_2 = mg - F_B = mg - \rho_f \cdot g \cdot V$$

$$T_1 - T_2 = mg - mg + \rho_f g \cdot V$$

$$\frac{T_1 - T_2}{T_1} = \frac{\rho_f g \cdot V}{mg} = \frac{\rho_f \cdot V}{\rho_0 \cdot V}$$

$$\Rightarrow \rho_0 = \rho_f \frac{T_1}{T_1 - T_2}$$

Boat and a rock



$$mg + Mg = \rho_f g \cdot V_{D_1} \Rightarrow V_f + V_{D_1}$$

$$Mg = \rho_f g \cdot V_{D_2} \Rightarrow V_f + V_{D_2} + V_{stone}$$

$$\Delta V = (V_f + V_{D_1}) - (V_f + V_{D_2} + V_{stone})$$

$$= V_{D_1} - V_{D_2} - V_{stone}$$

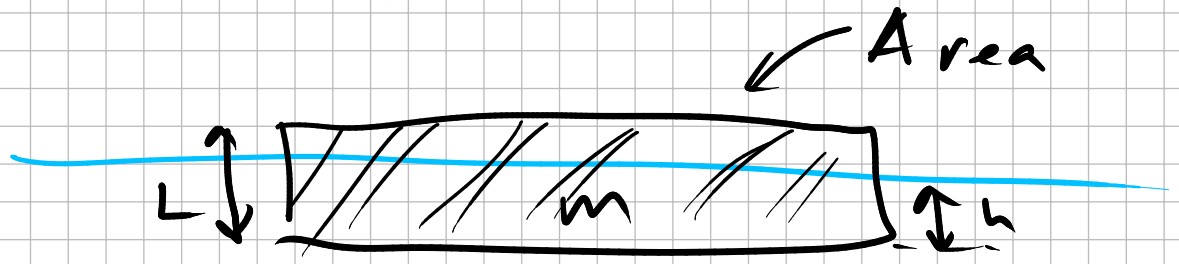
$$= \frac{mg + Mg}{\rho_f g} - \frac{Mg}{\rho_f g} - V_{stone}$$

$$= \frac{m}{\rho_f} - V_{stone} = \frac{m}{\rho_f} - \frac{m}{\rho_{stone}} > 0$$

initial level

lake was higher

Ice pack problem



$$mg = g \cdot \rho_f \cdot V_{submerged} =$$

$$\rho_{ice} \cdot V_{ice} \cdot g = g \cdot \rho_f \cdot h \cdot A$$

$$\rho_{ice} \cdot L \cdot A \cdot g = g \cdot \rho_f \cdot h \cdot A$$

$$\frac{\rho_{ice}}{\rho_f} = \frac{h}{L} \quad \rightarrow h/L$$

$$V_{ice} \Rightarrow V_{water\ melted} = \frac{m_{ice}}{\rho_f} = \frac{L \cdot A \cdot \rho_{ice}}{\rho_f} =$$

$$= L \cdot A \cdot \frac{h}{L} = h \cdot A_{subm.}$$