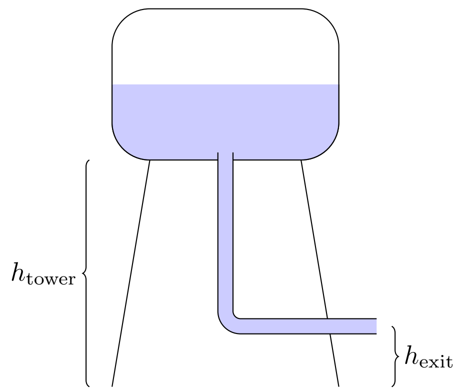
The following problem starts are included for your extra practice, with practice questions to follow.

Model water tower

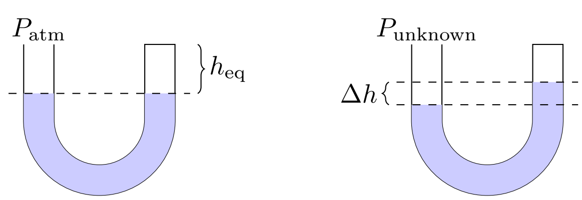
Jackson constructs a model of a water tower, connecting the bottom of the reservoir to a pipe that expels the water elsewhere. The water exits at a height (h_{exit}) that is smaller than the height of the tower (h_{tower}). The pressure at the bottom of the reservoir is fixed ($P_{\text{reservoir}}$), and is at least as large as atmospheric pressure. The pressure at the exit is atmospheric. The pipe has a constant area (A), and some resistance (R). Jackson can modify the model by changing the heights, the reservoir pressure, the area, and the resistance.



Unusual Barometer

An unusual barometer (i.e. device for measuring pressure) is constructed by having a U-shaped pipe that is open on the left end, and closed on the right end. On the open end, water is exposed to the pressure of the room it is in. On the closed end, some fixed amount of an ideal gas is stored at a constant temperature. Recall that the volume of an ideal gas is inversely proportional to pressure, e.g. doubling the pressure requires the volume to be halved.
The pipe has a constant area, and the amount of water is the same in the following scenarios:

- When the room is at atmospheric pressure, the water levels are equal, with h_{eq} being the height of the air column on the closed side.
- When the room is at some unknown pressure (P_{unknown}), a difference in the height of the water levels (Δh) is observed.



Energy Density Equation	**Continuity Equation**	**Constants**
$\Delta P + \frac{\Delta PE}{\text{vol.}} + \frac{\Delta KE}{\text{vol.}} = \frac{E_{\text{pump}}}{\text{vol.}} - \frac{\Delta E_{\text{th}}}{\text{vol.}}$	$I = Av$	$\rho_{\text{water}} = 1000\ \text{kg/m}^3$
$\Delta P + \rho g \Delta h + \frac{1}{2}\rho\Delta(v^2) = E_{\text{pump}}/\text{vol.} - IR$	$I_{\text{in}} = I_{\text{out}}$	$g = 10\ \text{m/s}^2$
		$P_{\text{atm}} = 1\ \text{atm} = 10^5\ \text{Pa OR J/m}^3\ \text{OR kg/(m}\cdot\text{s}^2)$