2. After the container is placed in the hot room with the lid on, the volume of air trapped inside is

\[ V = LA \]

where

\[ P_h = \rho_h R T_h \]

but the problem states that the hot room is in pressure equilibrium with the cool room, so

\[ P_h = P_c \]

and

\[ \rho_h = \frac{P_c}{RT_h} \]

and

\[ m = \frac{P_c V}{RT_h} \]

when the container is removed, it contains the same mass and has the same volume ⇒ same density

\[ \rho_h = \frac{m}{V} \]