Given: Manometer system as shown

**sa. liquid A = 0.75**
**sa. liquid B = 1.20**

Find: Gage pressure at point "a"

Solution:

**Basic equation:** \( \frac{dP}{dz} = -\gamma dz \)

**Assumptions:**
1. Inertial fluid
2. Gravity is only body force
3. Fluids directed vertically
4. \( \gamma \) = constant

\[ dP = -\gamma dz \]

For \( \gamma = \) constant, then \( dP = -\gamma dz \), i.e. \( P_2 - P_1 = -\gamma (z_2 - z_1) \)

\[ P_2 - P_1 = -\gamma (z_2 - z_1) \]
\[ P_3 - P_2 = -\gamma (z_3 - z_2) \]
\[ P_4 - P_3 = -\gamma (z_4 - z_3) \]
\[ P_5 - P_4 = -\gamma (z_5 - z_4) \]

Summing these equations recognizing that \( P_5 = P_a \) and \( P_1 = P_{atm} \) then

\[ P_a - P_{atm} = -\gamma (z_5 - z_1) - \gamma (z_4 - z_3) - \gamma (z_3 - z_2) - \gamma (z_2 - z_1) \]

\[ = \frac{120 + 62.4 + 62.4 + 62.4 + 62.4}{12} \times \frac{21}{12} \text{ in.} \times \frac{12}{12} \text{ in.} \]

\[ \frac{1.18 \text{ psig}}{\text{ft}^2} \times \frac{\text{in.}^2}{\text{ft}^2} \]

\[ P_a = 1.18 \text{ psig} \]