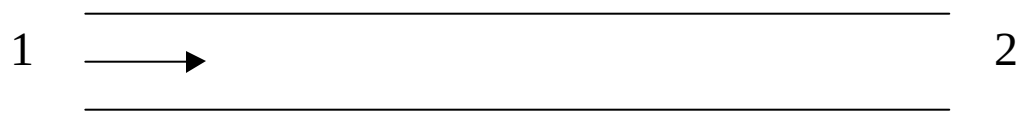
Dimensional Analysis on Pipe Flow

Given a water pipe as follows:



If the pressure drop due to friction in the pipe is ΔP and it depends on the following fluid properties and geometry parameters:

a. density of water, ρ
b. velocity of flow, V
c. diameter of pipe, D
d. surface roughness of pipe, ε
e. dynamic viscosity of fluid, μ
f. length of pipe, l

so that

$$\Delta P = f(\rho, V, D, \varepsilon, \mu, l)$$

Perform a dimensional analysis on the above functional dependency by choosing the density of water, velocity of flow and diameter of pipe as the repeating variables.