Kinetic gas equation

Total change in momentum of face A and B in x direction

$$= \frac{m\bar{v}_x^2}{l} + \frac{m\bar{v}_x^2}{l}$$

$$= \frac{2mv_x^2}{l}.$$

So net change in momentum in y and z direction are $\frac{2m\bar{v}_y^2}{L}$ and $\frac{2m\bar{v}_z^2}{L}$.

Hence net change in momentum in x, y and z direction $= \frac{2mv_x^2}{l} + \frac{2mv_y^2}{l} + \frac{2mv_z^2}{l} = \frac{2m}{l}(v_x^2 + v_y^2 + v_z^2)$

$$= \frac{2m}{l}\bar{v}^2 \quad (\because \bar{v}^2 = v_x^2 + v_y^2 + v_z^2) \text{ from eq(1)}$$

For n - molecules.

Net change in momentum $= \frac{2mn\bar{v}^2}{l}.$

we know that change in momentum in one second is called force.

So, $F = \frac{2mn\bar{v}^2}{l}$

And $P = \frac{F}{A} = \frac{2mn\bar{v}^2}{l \times 6l^2} = \frac{\cancel{2}mn\bar{v}^2}{\cancel{6}l^3} = \frac{1}{3}\frac{mn\bar{v}^2}{V} \quad (\because V = l^3)$

i.e $\boxed{P = \frac{1}{3}\frac{mn\bar{v}^2}{V} = \frac{mn\bar{v}^2}{3V}.}$ This is the required Kinetic gas equation.