

Initial:

$$M_{tot} = c_{A,i} V_A$$

Final ($D = \frac{c_{o,f}}{c_{A,f}}$):

$$M_{tot} = c_{A,f} V_A + c_{o,f} V_o$$

Solving for $c_{o,f}$ in terms of D :

$$c_{o,f} = \frac{M_{tot}}{\frac{V_A}{D} + V_o}$$

Solving for $\frac{c_{A,i}}{c_{o,f}}$:

$$\frac{c_{A,i}}{c_{o,f}} = \frac{\frac{V_A}{D} + V_o}{V_A} = \frac{1}{D} + \frac{V_o}{V_A}$$