**Molar concentration to molal concentration to mass fraction converter**

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*Software: MATLAB R2019b*

- **Parameter description**

  Molar concentration: $c_M = \frac{n_{solute}}{V_{solution}}$ [mol/L]

  Molal concentration: $c_m = \frac{n_{solute}}{m_{solvent}}$ [mol/kg]

  Mass fraction: $c_{wt\%} = \frac{m_{solute}}{m_{solution}} 100$ [kg/kg%]

  Density of solution: $\rho_{solution}$ [kg/L] = [g/cm^3]

  Molar mass of solute: $M_{solute}$ [g/mol]

- **Conversion equations**

  - $c_m$ to $c_M$

    $$c_M = \frac{\rho_{solution}}{\frac{1}{c_m} + \frac{M_{solute}}{1000}}$$

  - $c_M$ to $c_m$

    $$c_m = \frac{1}{\frac{\rho_{solution}}{c_M} - \frac{M_{solute}}{1000}}$$

  - $c_M$ to $c_{wt\%}$

    $$c_M = c_{wt\%}\, \rho_{solution} \frac{1000}{M_{solute}} \frac{1}{100}$$

  - $c_M$ to $c_{wt\%}$

    $$c_{wt\%} = \frac{c_M}{\rho_{solution}} \frac{M_{solute}}{1000} 100$$

  - $c_m$ to $c_{wt\%}$

    $$c_{wt\%} = \frac{1}{\frac{1000}{c_m M_{solute}} + 1} 100$$

  - $c_{wt\%}$ to $c_m$

    $$c_m = \frac{1000}{M_{solute}(\frac{100}{c_{wt\%}} - 1)}$$