calculatoratoz.com

unitsconverters.com

Co-Relation of Dimensionless Numbers Formulas

Calculators! Examples! Conversions!

Bookmark **calculatoratoz.com**, **unitsconverters.com**

Widest Coverage of Calculators and Growing - **30,000+ Calculators!**
Calculate With a Different Unit for Each Variable - **In built Unit Conversion!**
Widest Collection of Measurements and Units - **250+ Measurements!**

Feel free to SHARE this document with your friends!

Please leave your feedback here...

List of 11 Co-Relation of Dimensionless Numbers Formulas

Co-Relation of Dimensionless Numbers

1) Fourier Number

Open Calculator

fx $$F_o = \frac{\alpha \cdot \tau_c}{s^2}$$

ex $$0.293006 = \frac{5.58\text{m}^2/\text{s} \cdot 2.5\text{s}}{(6.9\text{m})^2}$$

2) Nusselt Number for Transitional and Rough Flow in Circular Tube

fx

Open Calculator

$$Nu = \left(\frac{f_{Darcy}}{8}\right) \cdot (Re - 1000) \cdot \frac{Pr}{1 + 12.7 \cdot \left(\left(\frac{f_{Darcy}}{8}\right)^{0.5}\right) \cdot \left((Pr)^{\frac{2}{3}} - 1\right)}$$

ex $$17.28493 = \left(\frac{0.04}{8}\right) \cdot (5000 - 1000) \cdot \frac{0.7}{1 + 12.7 \cdot \left(\left(\frac{0.04}{8}\right)^{0.5}\right) \cdot \left((0.7)^{\frac{2}{3}} - 1\right)}$$

3) Nusselt Number using Dittus Boelter Equation for Cooling

Open Calculator

fx $$Nu = 0.023 \cdot (Re)^{0.8} \cdot (Pr)^{0.3}$$

ex $$18.81193 = 0.023 \cdot (5000)^{0.8} \cdot (0.7)^{0.3}$$

4) Nusselt Number using Dittus Boelter Equation for Heating

Open Calculator

$$\mathrm{Nu} = 0.023 \cdot (\mathrm{Re})^{0.8} \cdot (\mathrm{Pr})^{0.4}$$

$$18.15278 = 0.023 \cdot (5000)^{0.8} \cdot (0.7)^{0.4}$$

5) Prandtl Number

Open Calculator

$$\mathrm{Pr} = \mathrm{c} \cdot \frac{\mu_{\mathrm{viscosity}}}{\mathrm{k}}$$

$$0.71128 = 4.184\mathrm{kJ/kg*K} \cdot \frac{1.02\mathrm{Pa*s}}{6000\mathrm{W/(m*K)}}$$

6) Prandtl Number using Diffusivities

Open Calculator

$$\mathrm{Pr} = \frac{\nu}{\alpha}$$

$$0.716846 = \frac{4\mathrm{m^2/s}}{5.58\mathrm{m^2/s}}$$

7) Reynolds Number for Circular Tubes

Open Calculator

$$\mathrm{Re} = \rho \cdot \mathrm{u_{Fluid}} \cdot \frac{\mathrm{D_{Tube}}}{\mu_{\mathrm{viscosity}}}$$

$$5176.471 = 400\mathrm{kg/m^3} \cdot 12\mathrm{m/s} \cdot \frac{1.1\mathrm{m}}{1.02\mathrm{Pa*s}}$$

8) Reynolds Number for Non-Circular Tubes

Open Calculator

$$\mathrm{Re} = \rho \cdot \mathrm{u_{Fluid}} \cdot \frac{\mathrm{L_c}}{\mu_{\mathrm{viscosity}}}$$

$$5129.412 = 400\mathrm{kg/m^3} \cdot 12\mathrm{m/s} \cdot \frac{1.09\mathrm{m}}{1.02\mathrm{Pa*s}}$$

9) Stanton Number given Fanning Friction Factor

Open Calculator

fx $$\mathrm{St} = \frac{\frac{\mathrm{f}}{2}}{(\mathrm{Pr})^{\frac{2}{3}}}$$

ex $$0.005771 = \frac{\frac{0.0091}{2}}{(0.7)^{\frac{2}{3}}}$$

10) Stanton Number using Basic Fluid Properties

Open Calculator

fx $$\mathrm{St} = \frac{\mathrm{h_{outside}}}{\mathrm{c} \cdot \mathrm{u_{Fluid}} \cdot \rho}$$

ex $$4.9\mathrm{E\hat{}}\text{-}7 = \frac{9.8\mathrm{W/m^2{*}K}}{4.184\mathrm{kJ/kg{*}K} \cdot 12\mathrm{m/s} \cdot 400\mathrm{kg/m^3}}$$

11) Stanton Number using Dimensionless Numbers

Open Calculator

fx $$\mathrm{St} = \frac{\mathrm{Nu}}{\mathrm{Re} \cdot \mathrm{Pr}}$$

ex $$0.005143 = \frac{18}{5000 \cdot 0.7}$$

Variables Used

- **c** Specific Heat Capacity *(Kilojoule per Kilogram per K)*
- **D_{Tube}** Diameter of Tube *(Meter)*
- **f** Fanning Friction Factor
- **f_{Darcy}** Darcy Friction Factor
- **F_o** Fourier Number
- **$h_{outside}$** External Convection Heat Transfer Coefficient *(Watt per Square Meter per Kelvin)*
- **k** Thermal Conductivity *(Watt per Meter per K)*
- **L_c** Characteristic Length *(Meter)*
- **Nu** Nusselt Number
- **Pr** Prandtl Number
- **Re** Reynolds Number
- **s** Characteristic Dimension *(Meter)*
- **St** Stanton Number
- **u_{Fluid}** Fluid Velocity *(Meter per Second)*
- **α** Thermal Diffusivity *(Square Meter Per Second)*
- **α** Thermal Diffusivity *(Square Meter Per Second)*
- **$\mu_{viscosity}$** Dynamic Viscosity *(Pascal Second)*
- **ρ** Density *(Kilogram per Cubic Meter)*
- ν Momentum Diffusivity *(Square Meter Per Second)*
- τ_c Characteristic Time *(Second)*

Constants, Functions, Measurements used

- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Time** in Second (s)
  Time Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Thermal Conductivity** in Watt per Meter per K (W/(m*K))
  Thermal Conductivity Unit Conversion
- Measurement: **Specific Heat Capacity** in Kilojoule per Kilogram per K (kJ/kg*K)
  Specific Heat Capacity Unit Conversion
- Measurement: **Heat Transfer Coefficient** in Watt per Square Meter per Kelvin (W/m²*K)
  Heat Transfer Coefficient Unit Conversion
- Measurement: **Dynamic Viscosity** in Pascal Second (Pa*s)
  Dynamic Viscosity Unit Conversion
- Measurement: **Density** in Kilogram per Cubic Meter (kg/m³)
  Density Unit Conversion
- Measurement: **Diffusivity** in Square Meter Per Second (m²/s)
  Diffusivity Unit Conversion

Check other formula lists

- Basics of Heat Transfer Formulas
- Co-Relation of Dimensionless Numbers Formulas
- Heat Exchanger Formulas
- Heat Exchanger and its Effectiveness Formulas
- Heat Transfer from Extended Surfaces (Fins) Formulas
- Heat Transfer from Extended Surfaces (Fins), Critical Thickness of Insulation and Thermal Resistance Formulas
- Thermal Resistance Formulas
- Unsteady State Heat Conduction Formulas

Feel free to SHARE this document with your friends!

PDF Available in

English Spanish French German Russian Italian Portuguese Polish Dutch

12/14/2023 | 5:45:08 AM UTC

Please leave your feedback here...