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Noise Pollution Formulas

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List of 31 Noise Pollution Formulas

Noise Pollution

Characteristics of Sound and its Measurements

1) Temperature in Kelvin given Speed of Sound

Open Calculator

fx $$T = \left(\frac{C}{20.05}\right)^2$$

ex $$292.6574\text{K} = \left(\frac{343\text{m/s}}{20.05}\right)^2$$

2) Wavelength of Wave

Open Calculator

fx $$\lambda = \frac{C}{f}$$

ex $$0.599997\text{m} = \frac{343\text{m/s}}{571.67\text{Hz}}$$

Period and Frequency of Wave

3) Frequency given Period of Wave

Open Calculator

fx $$f = \frac{1}{T_p}$$

ex $$571.4286\text{Hz} = \frac{1}{0.00175\text{s}}$$

4) Frequency given Wavelength of Wave

Open Calculator

fx $$f = \frac{C}{\lambda}$$

ex $$571.6667\text{Hz} = \frac{343\text{m/s}}{0.6\text{m}}$$

5) Period of Wave

Open Calculator

fx $$T_p = \frac{1}{f}$$

ex $$0.001749\text{s} = \frac{1}{571.67\text{Hz}}$$

Root Mean Square Pressure

6) Root Mean Square Pressure given Sound Intensity

Open Calculator

fx $P_{rms} = \sqrt{I \cdot \rho \cdot C}$

ex $0.000211\text{Pa} = \sqrt{1\text{E^-10W/m}^2 \cdot 1.293\text{kg/m}^3 \cdot 343\text{m/s}}$

7) Root Mean Square Pressure when Sound Pressure Level

Open Calculator

fx $P_m = \left(20 \cdot 10^{-6}\right) \cdot 10^{\frac{L}{20}}$

ex $200\mu\text{Pa} = \left(20 \cdot 10^{-6}\right) \cdot 10^{\frac{20\text{dB}}{20}}$

Sound Intensity

8) Density of Air given Sound Intensity

Open Calculator

fx $\rho = \frac{P_{rms}^2}{I \cdot C}$

ex $1.285714\text{kg/m}^3 = \frac{(0.00021\text{Pa})^2}{1\text{E^-10W/m}^2 \cdot 343\text{m/s}}$

9) Power of Sound Wave given Sound Intensity

Open Calculator

fx $W = I \cdot A$

ex $1.4\text{E^-9W} = 1\text{E^-10W/m}^2 \cdot 14\text{m}^2$

10) Sound Intensity

Open Calculator

fx $$I = \frac{W}{A}$$

ex $$1E\hat{}\text{-}10W/m^2 = \frac{1.4E\hat{}\text{-}9W}{14m^2}$$

11) Sound Intensity Level

Open Calculator

fx $$L = 10 \cdot \log 10\left(\frac{I}{10^{-12}}\right)$$

ex $$20dB = 10 \cdot \log 10\left(\frac{1E\hat{}\text{-}10W/m^2}{10^{-12}}\right)$$

12) Sound Intensity using Sound Intensity Level

Open Calculator

fx $$I = \left(10^{-12}\right) \cdot 10^{\frac{L}{10}}$$

ex $$1E\hat{}\text{-}10W/m^2 = \left(10^{-12}\right) \cdot 10^{\frac{20dB}{10}}$$

13) Sound Intensity with respect to Sound Pressure

Open Calculator

fx $$I = \left(\frac{P_{rms}^2}{\rho \cdot C}\right)$$

ex $$9.9E\hat{}\text{-}11W/m^2 = \left(\frac{(0.00021Pa)^2}{1.293kg/m^3 \cdot 343m/s}\right)$$

14) Unit Area given Sound Intensity

Open Calculator

fx $$A = \frac{W}{I}$$

ex $$14\text{m}^2 = \frac{1.4\text{E}\hat{}\text{-}9\text{W}}{1\text{E}\hat{}\text{-}10\text{W/m}^2}$$

Sound Pressure

15) Barometric Pressure given Sound Pressure

Open Calculator

fx $$P_b = P_{atm} - P_s$$

ex $$100525\text{Pa} = 101325\text{Pa} - 800\text{Pa}$$

16) Sound Pressure

Open Calculator

fx $$P_s = P_{atm} - P_b$$

ex $$800\text{Pa} = 101325\text{Pa} - 100525\text{Pa}$$

17) Sound Pressure Level in Decibels (Root Mean Square Pressure)

Open Calculator

fx $$L = 20 \cdot \log 10\left(\frac{P_m}{20 \cdot 10^{-6}}\right)$$

ex $$20\text{dB} = 20 \cdot \log 10\left(\frac{200\mu\text{Pa}}{20 \cdot 10^{-6}}\right)$$

18) Total Atmospheric Pressure given Sound Pressure

Open Calculator

fx $$P_{atm} = P_s + P_b$$

ex $$101325\text{Pa} = 800\text{Pa} + 100525\text{Pa}$$

Velocity of Sound

19) Speed of Sound Wave

Open Calculator

fx $$C = 20.05 \cdot \sqrt{T}$$

ex $$342.9957\text{m/s} = 20.05 \cdot \sqrt{292.65\text{K}}$$

20) Velocity for Wavelength of Wave

Open Calculator

fx $$C = (\lambda \cdot f)$$

ex $$343.002\text{m/s} = (0.6\text{m} \cdot 571.67\text{Hz})$$

21) Velocity of Sound Wave given Sound Intensity

Open Calculator

fx $$C = \frac{P_{rms}^2}{I \cdot \rho}$$

ex $$341.0673\text{m/s} = \frac{(0.00021\text{Pa})^2}{1\text{E^-10W/m}^2 \cdot 1.293\text{kg/m}^3}$$

Levels of Noise

22) Sound Intensity given Sound Level in Bels

Open Calculator

fx $$I = I_o \cdot 10^{L_b}$$

ex $$1E\hat{}\text{-}10W/m^2 = 1E\hat{}\text{-}12W/m^2 \cdot 10^{0.2B}$$

23) Sound Intensity given Sound Level in Decibels

Open Calculator

fx $$I = (I_o) \cdot 10^{\frac{L}{10}}$$

ex $$1E\hat{}\text{-}10W/m^2 = (1E\hat{}\text{-}12W/m^2) \cdot 10^{\frac{20dB}{10}}$$

24) Sound Level in Bels

Open Calculator

fx $$L_b = \log 10\left(\frac{I}{I_o}\right)$$

ex $$0.2B = \log 10\left(\frac{1E\hat{}\text{-}10W/m^2}{1E\hat{}\text{-}12W/m^2}\right)$$

25) Sound Level in Decibels

Open Calculator

fx $$L = 10 \cdot \log 10\left(\frac{I}{I_o}\right)$$

ex $$20dB = 10 \cdot \log 10\left(\frac{1E\hat{}\text{-}10W/m^2}{1E\hat{}\text{-}12W/m^2}\right)$$

26) Standard Sound Intensity given Sound Level in Bels

Open Calculator

fx $$I_o = \frac{I}{10^{L_b}}$$

ex $$1E\hat{}\text{-}12W/m^2 = \frac{1E\hat{}\text{-}10W/m^2}{10^{0.2B}}$$

27) Standard Sound Intensity given Sound Level in Decibels

Open Calculator

fx $$I_o = \frac{I}{10^{\frac{L}{10}}}$$

ex $$1E\hat{}\text{-}12W/m^2 = \frac{1E\hat{}\text{-}10W/m^2}{10^{\frac{20dB}{10}}}$$

Noise Abatement and Control

28) Distance between Source and Barrier given Noise Reduction in Decibels

Open Calculator

fx $$R = \frac{20 \cdot h_w^2}{\lambda \cdot 10^{\frac{N}{10}}}$$

ex $$1.012983m = \frac{20 \cdot (3.1m)^2}{0.6m \cdot 10^{\frac{25dB}{10}}}$$

29) Height of Barrier Wall given Noise Reduction in Decibels

Open Calculator

fx $$h_w = \sqrt{\left(\frac{\lambda \cdot R}{20}\right) \cdot 10^{\frac{N}{10}}}$$

ex $$3.095432\text{m} = \sqrt{\left(\frac{0.6\text{m} \cdot 1.01\text{m}}{20}\right) \cdot 10^{\frac{25\text{dB}}{10}}}$$

30) Noise Reduction in Decibels

Open Calculator

fx $$N = 10 \cdot \log 10\left(\frac{20 \cdot h_w^2}{\lambda \cdot R}\right)$$

ex $$25.01281\text{dB} = 10 \cdot \log 10\left(\frac{20 \cdot (3.1\text{m})^2}{0.6\text{m} \cdot 1.01\text{m}}\right)$$

31) Wavelength of Sound given Noise Reduction in Decibels

Open Calculator

fx $$\lambda = \frac{20 \cdot h_w^2}{R \cdot 10^{\frac{N}{10}}}$$

ex $$0.601772\text{m} = \frac{20 \cdot (3.1\text{m})^2}{1.01\text{m} \cdot 10^{\frac{25\text{dB}}{10}}}$$

Variables Used

- **A** Area for Sound Intensity *(Square Meter)*
- **C** Velocity of Sound Wave *(Meter per Second)*
- **f** Frequency of Sound Wave *(Hertz)*
- h_w Height of the Barrier Wall *(Meter)*
- **I** Sound Intensity Level *(Watt per Square Meter)*
- I_o Standard Sound Intensity *(Watt per Square Meter)*
- **L** Sound Level in Decibels *(Decibel)*
- L_b Sound Level in Bels *(Bel)*
- **N** Noise Reduction *(Decibel)*
- P_{atm} Total Atmospheric Pressure *(Pascal)*
- P_b Barometric Pressure *(Pascal)*
- P_m Pressure RMS in Micropascal *(Micropascal)*
- P_{rms} Pressure RMS *(Pascal)*
- P_s Pressure *(Pascal)*
- **R** Horizontal Distance *(Meter)*
- **T** Temperature *(Kelvin)*
- T_p Time Period of Sound Wave *(Second)*
- **W** Sound Power *(Watt)*
- **λ** Wavelength of Sound Wave *(Meter)*
- **ρ** Density of Air *(Kilogram per Cubic Meter)*

Constants, Functions, Measurements used

- Function: **log10**, log10(Number)
  The common logarithm, also known as the base-10 logarithm or the decimal logarithm, is a mathematical function that is the inverse of the exponential function.
- Function: **sqrt**, sqrt(Number)
  A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Time** in Second (s)
  Time Unit Conversion
- Measurement: **Temperature** in Kelvin (K)
  Temperature Unit Conversion
- Measurement: **Area** in Square Meter (m²)
  Area Unit Conversion
- Measurement: **Pressure** in Pascal (Pa), Micropascal (μPa)
  Pressure Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Power** in Watt (W)
  Power Unit Conversion
- Measurement: **Frequency** in Hertz (Hz)
  Frequency Unit Conversion
- Measurement: **Wavelength** in Meter (m)
  Wavelength Unit Conversion

- Measurement: **Density** in Kilogram per Cubic Meter (kg/m³)
  Density Unit Conversion
- Measurement: **Sound** in Decibel (dB), Bel (B)
  Sound Unit Conversion
- Measurement: **Intensity** in Watt per Square Meter (W/m²)
  Intensity Unit Conversion

Check other formula lists

- Design of a Chlorination System for Wastewater Disinfection Formulas
- Design of a Circular Settling Tank Formulas
- Design of a Plastic Media Trickling Filter Formulas
- Design of a Solid Bowl Centrifuge for Sludge Dewatering Formulas
- Design of an Aerated Grit Chamber Formulas
- Design of an Aerobic Digester Formulas
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