



# Sound Propagation and Resonance 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 12 Sound Propagation and Resonance Formulas

# Sound Propagation and Resonance

## Resonance in Pipes 🗗

### 1) Frequency of 1st Harmonic Closed Organ Pipe

$$\mathbf{f}_{1\mathrm{st}} = rac{1}{4} \cdot rac{\mathrm{v}_{\mathrm{w}}}{\mathrm{L}_{\mathrm{closed}}}$$

Open Calculator

$$\mathbf{ex} \boxed{32.5 \text{Hz} = \frac{1}{4} \cdot \frac{65 \text{m/s}}{0.5 \text{m}}}$$

### 2) Frequency of 2nd Harmonic Open Organ Pipe 🖸

$$f_{
m 2nd} = rac{v_{
m w}}{
m L_{
m open}}$$

Open Calculator

$$ext{ex} 90.27778 ext{Hz} = rac{65 ext{m/s}}{0.72 ext{m}}$$

#### 3) Frequency of 3rd Harmonic Closed Organ Pipe

$$\mathbf{f}_{\mathrm{3rd}} = rac{3}{4} \cdot rac{\mathrm{v_w}}{\mathrm{L_{closed}}}$$

Open Calculator 🖒

$$extbf{ex} 97.5 ext{Hz} = rac{3}{4} \cdot rac{65 ext{m/s}}{0.5 ext{m}}$$



#### 4) Frequency of 4th Harmonic Open Organ Pipe

 $extbf{f}_{4 ext{th}} = 2 \cdot rac{ ext{V}_{ ext{w}}}{ ext{L}_{ ext{open}}}$ 

Open Calculator

ex  $180.5556 ext{Hz} = 2 \cdot rac{65 ext{m/s}}{0.72 ext{m}}$ 

## 5) Frequency of Closed Organ Pipe

 $\mathbf{f_{closed\ pipe}} = rac{2 \cdot \mathrm{n} + 1}{4} \cdot rac{\mathrm{v_w}}{\mathrm{L_{closed}}}$ 

Open Calculator 🗗

Open Calculator

Open Calculator

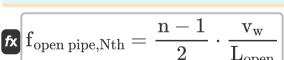
ex  $162.5 = \frac{2 \cdot 2 + 1}{4} \cdot \frac{65 \text{m/s}}{0.5 \text{m}}$ 

## 6) Frequency of Open Organ Pipe

 $\mathbf{f}_{\mathrm{open\;pipe}} = rac{\mathrm{n}}{2} \cdot rac{\mathrm{v}_{\mathrm{w}}}{\mathrm{L}_{\mathrm{open}}}$ 

 $\mathbf{ex} = \frac{2}{90.27778} = \frac{2}{2} \cdot \frac{65 \mathrm{m/s}}{0.72 \mathrm{m}}$ 

# $\begin{array}{ccc} 2 & 0.72 \mathrm{m} \end{array}$





 $\overline{\mathrm{L}_{\mathrm{open}}}$ 

$$ext{45.13889Hz} = rac{2-1}{2} \cdot rac{65 ext{m/s}}{0.72 ext{m}}$$





#### 8) Length of Closed Organ Pipe

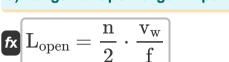
3

Open Calculator 🗗

$$\mathbf{L}_{\mathrm{closed}} = (2 \cdot \mathrm{n} + 1) \cdot rac{\lambda}{4}$$

$$\boxed{0.5\mathrm{m} = (2\cdot 2 + 1)\cdot \frac{0.4\mathrm{m}}{4}}$$

#### 9) Length of Open Organ Pipe



# Open Calculator 🖸

# Sound Propagation

#### 10) Intensity of Sound

$$extbf{fx} I_{
m s} = rac{
m P}{
m A}$$

$$m ex = 20W/m^2 = rac{900W}{45m^2}$$

Open Calculator 🗗





#### 11) Velocity of Sound in Liquid

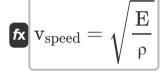
 $ag{K} v_{
m speed} = \sqrt{rac{K}{
ho}}$ 

Open Calculator

Open Calculator

ex 
$$1480 ext{m/s} = \sqrt{rac{2183.83 ext{MPa}}{997 ext{kg/m}^3}}$$

#### 12) Velocity of Sound in Solids



ex 
$$1480.912 \mathrm{m/s} = \sqrt{\frac{2186.52 \mathrm{MPa}}{997 \mathrm{kg/m^3}}}$$



#### Variables Used

- A Normal Area (Square Meter)
- E Elasticity (Megapascal)
- **f** Frequency (Hertz)
- f<sub>1st</sub> Frequency of 1st Harmonic Closed Organ Pipe (Hertz)
- **f**<sub>2nd</sub> Frequency of 2nd Harmonic Open Organ Pipe (Hertz)
- f<sub>3rd</sub> Frequency of 3rd Harmonic Closed Organ Pipe (Hertz)
- f<sub>4th</sub> Frequency of 4th Harmonic Open Organ Pipe (Hertz)
- fclosed pipe Frequency of Closed Organ Pipe
- fopen pipe Frequency of Open Organ Pipe
- fopen pipe.Nth Frequency of Open Organ Pipe for Nth Overtone (Hertz)
- Is Sound Intensity (Watt per Square Meter)
- K Bulk Modulus (Megapascal)
- L<sub>closed</sub> Length of Closed Organ Pipe (Meter)
- Lopen Length of Open Organ Pipe (Meter)
- n Number of Nodes
- P Power (Watt)
- V<sub>speed</sub> Velocity of Sound (Meter per Second)
- V<sub>w</sub> Velocity of Wave (Meter per Second)
- **\( \lambda \)** Wavelength (*Meter*)
- p Density (Kilogram per Cubic Meter)





#### Constants, Functions, Measurements used

- 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: Area in Square Meter (m²)

  Area Unit Conversion
- Measurement: Pressure in Megapascal (MPa)
   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: Density in Kilogram per Cubic Meter (kg/m³)
   Density Unit Conversion
- Measurement: Intensity in Watt per Square Meter (W/m²)
   Intensity Unit Conversion





#### Check other formula lists

- Sound Propagation and Resonance Formulas
- Wave Properties and Equations Formulas

Feel free to SHARE this document with your friends!

#### **PDF Available in**

English Spanish French German Russian Italian Portuguese Polish Dutch

7/24/2024 | 8:01:35 AM UTC

Please leave your feedback here...



