



# **Waves And Sound 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 49 Waves And Sound Formulas

## Waves And Sound 🕑

### 1) Frequency of Progressive Wave

fx 
$$\mathbf{f}_{\mathrm{w}} = rac{\omega_{\mathrm{f}}}{2\cdot\pi}$$

$$1.636113 \text{Hz} = \frac{10.28 \text{Hz}}{2 \cdot \pi}$$

### 2) Frequency of Wave using Time Period C

fx 
$$f_w = rac{1}{T_w}$$
 Open Calculator C

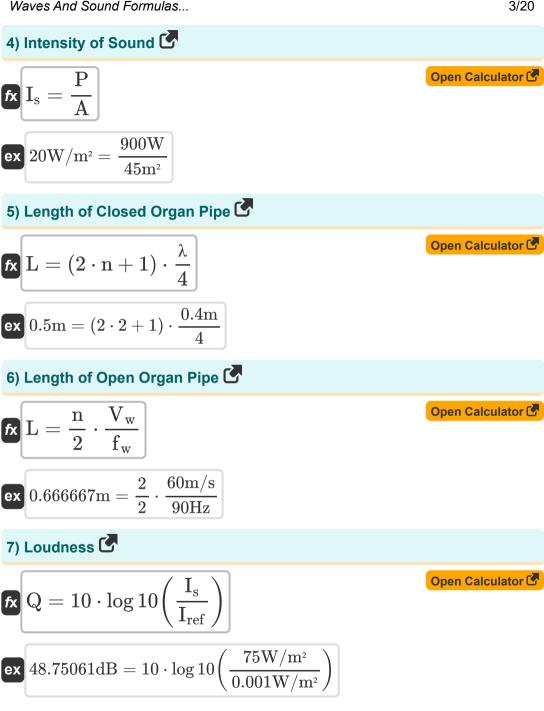
ex 
$$0.384615 \text{Hz} = \frac{1}{2.6 \text{s}}$$

### 3) Frequency of Wavelength using Velocity

fx 
$$f_w = rac{V_w}{\lambda}$$
 Open Calculator P  $rac{2}{2}$ 

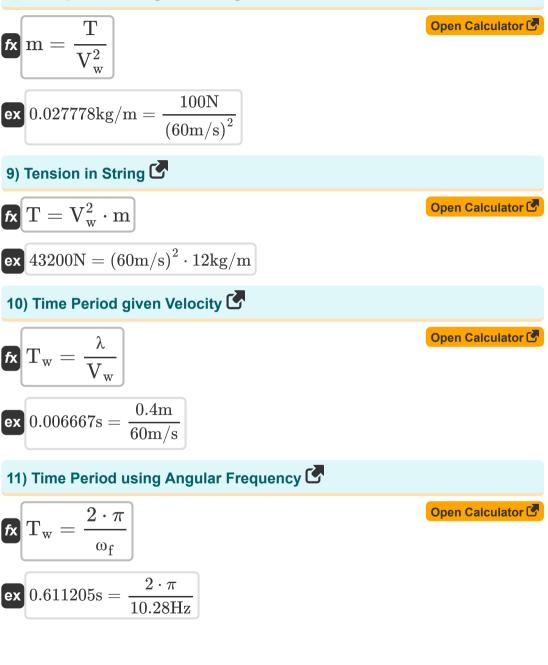






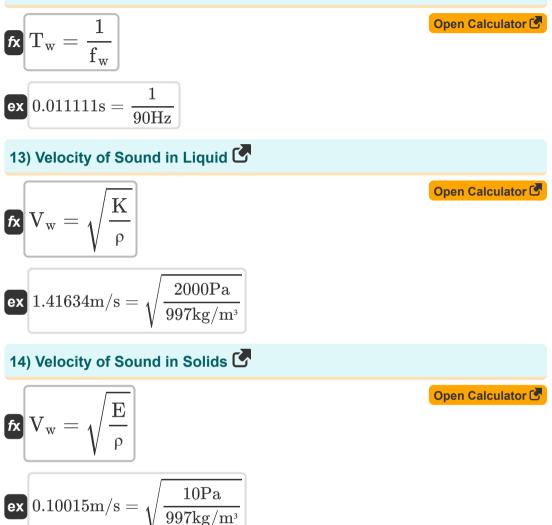








#### 12) Time Period using Frequency 🕑





### 15) Wave Number 🗹

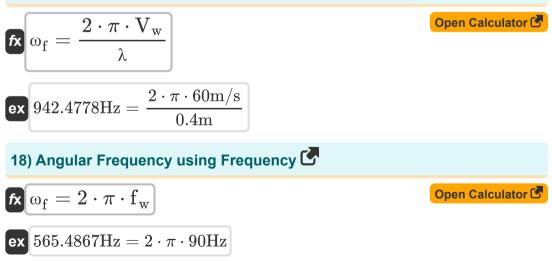


$$\mathbf{f_{x}} k = \frac{\omega_{f}}{V_{w}}$$
(0pen Calculator C

$$= 0.171333 = \frac{10.28 \text{Hz}}{60 \text{m/s}}$$

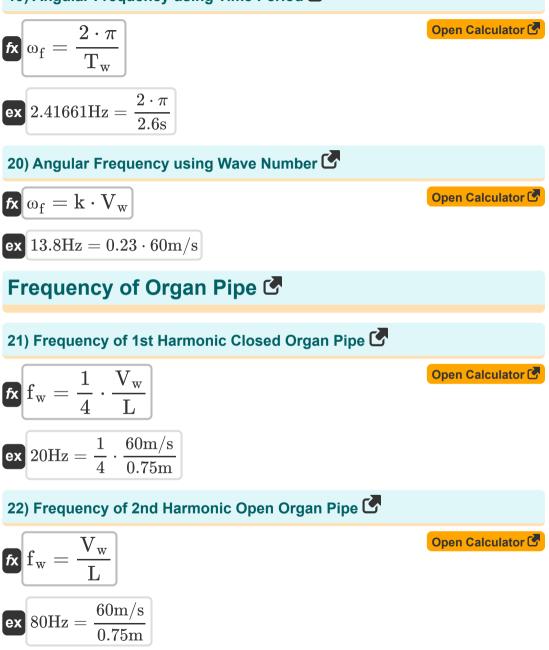
## Angular Frequency 🕑

### 17) Angular Frequency given Velocity 🕑











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



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

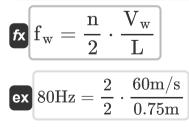


#### 25) Frequency of Closed Organ Pipe

fx 
$$\mathbf{f_w} = rac{2 \cdot \mathrm{n} + 1}{4} \cdot rac{\mathrm{V_w}}{\mathrm{L}}$$

ex 
$$100 \text{Hz} = rac{2 \cdot 2 + 1}{4} \cdot rac{60 \text{m/s}}{0.75 \text{m}}$$

### 26) Frequency of Open Organ Pipe 🕑





Open Calculator

### 27) Frequency of Open Organ Pipe for Nth Overtone

fx 
$$f_w = rac{n-1}{2} \cdot rac{V_w}{L}$$
  
ex  $40 \mathrm{Hz} = rac{2-1}{2} \cdot rac{60 \mathrm{m/s}}{0.75 \mathrm{m}}$ 

## Observed Frequency

## 28) Observed Frequency when Observer and Source Move Away from Each Other

fx 
$$\mathbf{F}_{o} = \left(\frac{\mathbf{c} - \mathbf{V}_{o}}{\mathbf{c} + \mathbf{V}_{source}}\right) \cdot \mathbf{f}_{w}$$
  
ex  $41.06383 \text{Hz} = \left(\frac{343 \text{m/s} - 150 \text{m/s}}{343 \text{m/s} + 80 \text{m/s}}\right) \cdot 90 \text{Hz}$ 

29) Observed Frequency when Observer and Source Move towards Each Other

$$\begin{aligned} & \textbf{fx} \ \textbf{F}_{o} = \left(\frac{\textbf{c} + \textbf{V}_{o}}{\textbf{c} - \textbf{V}_{source}}\right) \cdot \textbf{f}_{w} \\ & \textbf{ex} \ 168.7072 \text{Hz} = \left(\frac{343 \text{m/s} + 150 \text{m/s}}{343 \text{m/s} - 80 \text{m/s}}\right) \cdot 90 \text{Hz} \end{aligned}$$

Open Calculator

Open Calculator

### 30) Observed Frequency when Observer Moves Away from Source

fx 
$$\mathbf{F}_{\mathrm{o}} = \mathrm{c} - \mathrm{V}_{\mathrm{o}}$$

ex 
$$193 \text{Hz} = 343 \text{m/s} - 150 \text{m/s}$$

# 31) Observed Frequency when Observer Moves Away from Source using Wavelength

$$f_{x} F_{o} = \frac{c - V_{o}}{\lambda}$$

$$e_{x} 482.5 Hz = \frac{343 m/s - 150 m/s}{0.4 m}$$

$$32) Observed Frequency when Observer Moves towards Source C
$$(c + V_{o} + V_{o})$$
Open Calculator ($$

fx 
$$\mathbf{F}_{\mathrm{o}} = \left(rac{\mathrm{c} + \mathrm{v}_{\mathrm{obj}}}{\mathrm{c}}
ight) \cdot \mathrm{f}_{\mathrm{w}}$$

ex 
$$103.1195 \mathrm{Hz} = \left(rac{343 \mathrm{m/s} + 50 \mathrm{m/s}}{343 \mathrm{m/s}}
ight) \cdot 90 \mathrm{Hz}$$

# 33) Observed Frequency when Observer Moves towards Source and Source Moves Away

fx 
$$F_o = \left(\frac{c + V_o}{c + V_{source}}\right) \cdot f_w$$
  
ex  $104.8936 Hz = \left(\frac{343 m/s + 150 m/s}{343 m/s + 80 m/s}\right) \cdot 90 Hz$ 



Open Calculator 🕑

# 34) Observed Frequency when Observer Moves towards Source using Wavelength

fx 
$$F_o=rac{c+V_{obj}}{\lambda}$$
 Open Calculator Provide  $P_o=\frac{c+V_{obj}}{\lambda}$ 

## 35) Observed Frequency when Source Moves Away from Observer 🕑

fx 
$$\mathbf{F}_{o} = \frac{\mathbf{c} \cdot \mathbf{f}_{w}}{\mathbf{c} + \mathbf{V}_{source}}$$
 Open Calculator   
ex  $72.97872 \text{Hz} = \frac{343 \text{m/s} \cdot 90 \text{Hz}}{343 \text{m/s} + 80 \text{m/s}}$   
36) Observed Frequency when Source Moves towards Observer

fx 
$$F_o = \frac{c \cdot f_w}{c - V_{source}}$$
  
ex  $117.3764 Hz = \frac{343 m/s \cdot 90 Hz}{343 m/s - 80 m/s}$ 





# 37) Observed Frequency when Source Moves towards Observer and Observer Moves Away

$$\mathbf{fx} \mathbf{F}_{o} = \left(\frac{c - V_{o}}{c - V_{source}}\right) \cdot \mathbf{f}_{w}$$
 Open Calculator

ex 
$$66.04563 \mathrm{Hz} = \left(rac{343 \mathrm{m/s} - 150 \mathrm{m/s}}{343 \mathrm{m/s} - 80 \mathrm{m/s}}
ight) \cdot 90 \mathrm{Hz}$$

## Velocity of Wave

### 38) Velocity of Progressive Wave 🕑



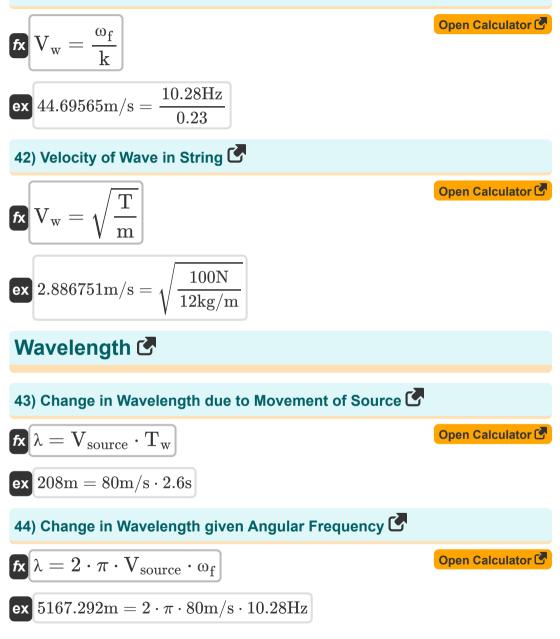
#### 39) Velocity of Progressive Wave given Angular Frequency 🗹

$$fx V_w = \frac{\lambda \cdot \omega_f}{4 \cdot \pi}$$

$$ex 0.327223 m/s = \frac{0.4m \cdot 10.28 Hz}{4 \cdot \pi}$$
40) Velocity of Progressive Wave using Frequency C
$$fx V_w = \lambda \cdot f_w$$

$$ex 36m/s = 0.4m \cdot 90 Hz$$

#### 41) Velocity of Wave given Wave Number 🕑

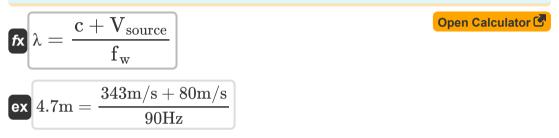








## 46) Effective Wavelength when Source Moves Away from Observer



## 47) Effective Wavelength when Source Moves towards Observer

$$\begin{aligned} & \lambda = \frac{c - V_{source}}{f_w} \\ & \bullet \\ & \bullet \\ & 2.922222m = \frac{343m/s - 80m/s}{90Hz} \\ & \bullet \\ & \bullet$$

$$\begin{array}{c} \textbf{ex} \end{array} 0.666667 \text{m} = \frac{60 \text{m/s}}{90 \text{Hz}} \end{array}$$





## 49) Wavelength of Wave using Velocity 🕑

fx 
$$\lambda = V_w \cdot T_w$$
 Open Calculator C

## ex $156\mathrm{m} = 60\mathrm{m/s} \cdot 2.6\mathrm{s}$





## Variables Used

- A Normal Area (Square Meter)
- C Velocity of Sound (Meter per Second)
- E Elasticity (Pascal)
- **F**o Frequency Observed (*Hertz*)
- **f**<sub>w</sub> Wave Frequency (*Hertz*)
- Iref Reference Intensity (Watt per Square Meter)
- I<sub>s</sub> Sound Intensity (Watt per Square Meter)
- k Wave Number
- K Bulk Modulus (Pascal)
- L Length of Organ Pipe (Meter)
- **M** Mass per Unit Length (Kilogram per Meter)
- **n** Number of Nodes
- **P** Power (Watt)
- **Q** Loudness (Decibel)
- **T** Tension of String (Newton)
- **T**<sub>w</sub> Time Period of Progressive Wave (Second)
- Vo Velocity Observed (Meter per Second)
- Vobi Velocity of Object (Meter per Second)
- V<sub>source</sub> Velocity of Source (Meter per Second)
- V<sub>w</sub> Velocity of Wave (Meter per Second)
- λ Wavelength (Meter)
- **p** Density (Kilogram per Cubic Meter)



• ω<sub>f</sub> Angular Frequency (*Hertz*)



## **Constants, Functions, Measurements used**

- Constant: pi, 3.14159265358979323846264338327950288 Archimedes' constant
- 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: Area in Square Meter (m<sup>2</sup>) Area Unit Conversion
- Measurement: Pressure in Pascal (Pa) Pressure Unit Conversion
- Measurement: Speed in Meter per Second (m/s) Speed Unit Conversion
- Measurement: Power in Watt (W) Power Unit Conversion
- Measurement: Force in Newton (N) Force Unit Conversion
- Measurement: Frequency in Hertz (Hz) Frequency Unit Conversion





- Measurement: Density in Kilogram per Cubic Meter (kg/m<sup>3</sup>) Density Unit Conversion
- Measurement: Sound in Decibel (dB) Sound Unit Conversion
- Measurement: Linear Mass Density in Kilogram per Meter (kg/m) Linear Mass Density Unit Conversion
- Measurement: Intensity in Watt per Square Meter (W/m<sup>2</sup>) Intensity Unit Conversion



## **Check other formula lists**

- Current Electricity Formulas C
- Elasticity & Simple Harmonic Motion(SHM) Formulas
- Gravitation Formulas
- Microscopes and Telescopes
   Formulas
- Optics Formulas
- Tribology Formulas 🖸
- Wave Optics Formulas
- Waves And Sound Formulas G

Feel free to SHARE this document with your friends!

### **PDF Available in**

English Spanish French German Russian Italian Portuguese Polish Dutch

5/10/2024 | 10:00:10 AM UTC

Please leave your feedback here ...



