



# Doppler Effect and Wavelength Changes Formulas

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## List of 15 Doppler Effect and Wavelength Changes Formulas

## Doppler Effect and Wavelength Changes &

## Doppler Effect G

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

$$\mathbf{F}_{\mathrm{o}} = \left(rac{\mathrm{f}_{\mathrm{W}}\cdot(\mathrm{c}-\mathrm{V}_{\mathrm{o}})}{\mathrm{c}+\mathrm{V}_{\mathrm{source}}}
ight)$$

Open Calculator 🗗

$$ext{ex} 14.09929 ext{Hz} = \left(rac{200 ext{Hz} \cdot (343 ext{m/s} - 313.18 ext{m/s})}{343 ext{m/s} + 80 ext{m/s}}
ight)$$

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

$$\mathbf{F}_{\mathrm{o}} = \left(rac{\mathrm{f}_{\mathrm{W}}\cdot(\mathrm{c}+\mathrm{V}_{\mathrm{o}})}{\mathrm{c}-\mathrm{V}_{\mathrm{source}}}
ight)$$

Open Calculator

$$ext{ex} = 498.9962 ext{Hz} = \left(rac{200 ext{Hz} \cdot (343 ext{m/s} + 313.18 ext{m/s})}{343 ext{m/s} - 80 ext{m/s}}
ight)$$



### 3) Observed Frequency when Observer Moves Away from Source 🖸

$$\mathbf{f}_{\mathrm{N}} = \mathrm{f}_{\mathrm{W}} \cdot \left( rac{\mathrm{c} - \mathrm{V}_{\mathrm{o}}}{\mathrm{c}} 
ight)$$

Open Calculator

$$= 17.38776 \text{Hz} = 200 \text{Hz} \cdot \left( \frac{343 \text{m/s} - 313.18 \text{m/s}}{343 \text{m/s}} \right)$$

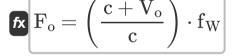
4) Observed Frequency when Observer Moves Away from Source using Wavelength

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

Open Calculator 2

$$ext{ex} 74.55 ext{Hz} = rac{343 ext{m/s} - 313.18 ext{m/s}}{0.4 ext{m}}$$

5) Observed Frequency when Observer Moves towards Source C



Open Calculator

$$oxed{ex} 382.6122 ext{Hz} = \left(rac{343 ext{m/s} + 313.18 ext{m/s}}{343 ext{m/s}}
ight) \cdot 200 ext{Hz}$$



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

 $\mathbf{F}_{\mathrm{o}} = \left( rac{\mathrm{c} + \mathrm{V}_{\mathrm{o}}}{\mathrm{c} + \mathrm{V}_{\mathrm{source}}} 
ight) \cdot \mathrm{f}_{\mathrm{W}}$ 

Open Calculator

ex  $310.2506 \mathrm{Hz} = \left( rac{343 \mathrm{m/s} + 313.18 \mathrm{m/s}}{343 \mathrm{m/s} + 80 \mathrm{m/s}} 
ight) \cdot 200 \mathrm{Hz}$ 

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

 $\mathbf{F}_{\mathrm{o}} = rac{\mathrm{c} + \mathrm{V}_{\mathrm{o}}}{\lambda}$ 

Open Calculator

 $extbf{ex} 1640.45 ext{Hz} = rac{343 ext{m/s} + 313.18 ext{m/s}}{0.4 ext{m}}$ 

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

 $\mathbf{F}_{\mathrm{o}} = \mathrm{f}_{\mathrm{W}} \cdot rac{\mathrm{c}}{\mathrm{c} + \mathrm{V}_{\mathrm{source}}}$ 

Open Calculator 🗗

 $ext{ex} 162.1749 ext{Hz} = 200 ext{Hz} \cdot rac{343 ext{m/s}}{343 ext{m/s} + 80 ext{m/s}}$ 



## 9) Observed Frequency when Source Moves towards Observer

 $\mathbf{F}_{\mathrm{o}} = \mathrm{f}_{\mathrm{W}} \cdot rac{\mathrm{c}}{\mathrm{c} - \mathrm{V}_{\mathrm{source}}}$ 

Open Calculator 🚰

 $ext{ex} \ 260.8365 ext{Hz} = 200 ext{Hz} \cdot rac{343 ext{m/s}}{343 ext{m/s} - 80 ext{m/s}}$ 

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

 $\mathbf{F}_{\mathrm{o}} = \left(rac{\mathrm{f}_{\mathrm{W}}\cdot(\mathrm{c}-\mathrm{V}_{\mathrm{o}})}{\mathrm{c}-\mathrm{V}_{\mathrm{source}}}
ight)$ 

Open Calculator

## Wavelength Changes

## 11) Change in Wavelength due to Movement of Source

fx  $\lambda = V_{
m source} \cdot T_{
m W}$ 

Open Calculator 🗗

 $\boxed{\texttt{ex} \ 0.4 \text{m} = 80 \text{m/s} \cdot 0.005 \text{s}}$ 

## 12) Change in Wavelength given Angular Frequency

fx  $\lambda = 2 \cdot \pi \cdot V_{source} \cdot \omega_f$ 

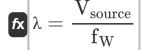
Open Calculator

 $0.402124 \mathrm{m} = 2 \cdot \pi \cdot 80 \mathrm{m/s} \cdot 0.0008 \mathrm{Hz}$ 





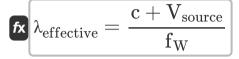
## 13) Change in Wavelength given Frequency



Open Calculator

$$ex 0.4m = \frac{80m/s}{200Hz}$$

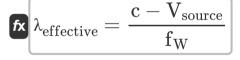
## 14) Effective Wavelength when Source Moves Away from Observer



Open Calculator

$$=$$
  $2.115 \mathrm{m} = rac{343 \mathrm{m/s} + 80 \mathrm{m/s}}{200 \mathrm{Hz}}$ 

## 15) Effective Wavelength when Source Moves towards Observer



Open Calculator

$$=$$
 1.315m  $=$   $\frac{343 \text{m/s} - 80 \text{m/s}}{200 \text{Hz}}$ 



#### Variables Used

- **c** Velocity of Sound (Meter per Second)
- F<sub>o</sub> Frequency Observed (Hertz)
- **f**<sub>W</sub> Wave Frequency (*Hertz*)
- Tw Time Period of Progressive Wave (Second)
- **V**<sub>0</sub> Velocity Observed (Meter per Second)
- **V**<sub>source</sub> Velocity of Source (Meter per Second)
- **λ** Wavelength (Meter)
- λ<sub>effective</sub> Effective Wavelength (Meter)
- ω<sub>f</sub> Angular Frequency (Hertz)





## Constants, Functions, Measurements used

- Constant: pi, 3.14159265358979323846264338327950288
   Archimedes' constant
- 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: Frequency in Hertz (Hz)
   Frequency Unit Conversion





#### **Check other formula lists**

- Doppler Effect and Wavelength
   Changes Formulas
- Sound Propagation and Resonance Formulas
- Wave Properties and Equations Formulas

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