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Wave Properties and Equations Formulas

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List of 23 Wave Properties and Equations Formulas

Wave Properties and Equations

Wave Characteristics

1) Loudness

Open Calculator

fx $$Q = 10 \cdot \log 10\left(\frac{I_s}{I_{ref}}\right)$$

ex $$48.75061\text{dB} = 10 \cdot \log 10\left(\frac{75\text{W/m}^2}{0.001\text{W/m}^2}\right)$$

2) Mass per Unit Length of String

Open Calculator

fx $$m = \frac{T}{V_w^2}$$

ex $$0.05\text{kg/m} = \frac{186.05\text{N}}{(61\text{m/s})^2}$$

3) Tension in String

Open Calculator

fx $$T = V_w^2 \cdot m$$

ex $$186.05\text{N} = (61\text{m/s})^2 \cdot 0.05\text{kg/m}$$

4) Wave Number

Open Calculator

fx $$k = \frac{2 \cdot \pi}{\lambda}$$

ex $$15.70796 = \frac{2 \cdot \pi}{0.4\text{m}}$$

5) Wave Number using Angular Frequency

Open Calculator

fx $$k = \frac{\omega_f}{V_w}$$

ex $$15.70492 = \frac{958\text{Hz}}{61\text{m/s}}$$

Wave Equations

6) Amplitude

Open Calculator

fx $$A = \frac{D}{f_w}$$

ex $$0.393494\text{m} = \frac{60\text{m}}{152.48\text{Hz}}$$

7) Angular Frequency given Velocity

Open Calculator

$$\omega_f = \frac{2 \cdot \pi \cdot V_w}{\lambda}$$

$$958.1858\text{Hz} = \frac{2 \cdot \pi \cdot 61\text{m/s}}{0.4\text{m}}$$

8) Angular Frequency using Frequency

Open Calculator

$$\omega_f = 2 \cdot \pi \cdot f_w$$

$$958.0601\text{Hz} = 2 \cdot \pi \cdot 152.48\text{Hz}$$

9) Angular Frequency using Time Period

Open Calculator

$$\omega_f = \frac{2 \cdot \pi}{T_W}$$

$$958.387\text{Hz} = \frac{2 \cdot \pi}{0.006556\text{s}}$$

10) Angular Frequency using Wave Number

Open Calculator

$$\omega_f = k \cdot V_w$$

$$957.7\text{Hz} = 15.7 \cdot 61\text{m/s}$$

11) Frequency of Progressive Wave

Open Calculator

fx $$f_w = \frac{\omega_f}{2 \cdot \pi}$$

ex $$152.4704\text{Hz} = \frac{958\text{Hz}}{2 \cdot \pi}$$

12) Frequency of Wave using Time Period

Open Calculator

fx $$f_w = \frac{1}{T_W}$$

ex $$152.532\text{Hz} = \frac{1}{0.006556\text{s}}$$

13) Frequency of Wavelength using Velocity

Open Calculator

fx $$f_w = \frac{V_w}{\lambda}$$

ex $$152.5\text{Hz} = \frac{61\text{m/s}}{0.4\text{m}}$$

14) Time Period given Velocity

Open Calculator

fx $$T_W = \frac{\lambda}{V_w}$$

ex $$0.006557\text{s} = \frac{0.4\text{m}}{61\text{m/s}}$$

15) Time Period using Angular Frequency

Open Calculator

$$T_W = \frac{2 \cdot \pi}{\omega_f}$$

$$0.006559\text{s} = \frac{2 \cdot \pi}{958\text{Hz}}$$

16) Time Period using Frequency

Open Calculator

$$T_W = \frac{1}{f_w}$$

$$0.006558\text{s} = \frac{1}{152.48\text{Hz}}$$

17) Velocity of Progressive Wave

Open Calculator

$$V_w = \frac{\lambda}{T_W}$$

$$61.01281\text{m/s} = \frac{0.4\text{m}}{0.006556\text{s}}$$

18) Velocity of Progressive Wave given Angular Frequency

Open Calculator

$$V_w = \frac{\lambda \cdot \omega_f}{2 \cdot \pi}$$

$$60.98817\text{m/s} = \frac{0.4\text{m} \cdot 958\text{Hz}}{2 \cdot \pi}$$

19) Velocity of Progressive Wave using Frequency

Open Calculator

fx $V_w = \lambda \cdot f_w$

ex $60.992\text{m/s} = 0.4\text{m} \cdot 152.48\text{Hz}$

20) Velocity of Wave given Wave Number

Open Calculator

fx $V_w = \frac{\omega_f}{k}$

ex $61.01911\text{m/s} = \frac{958\text{Hz}}{15.7}$

21) Velocity of Wave in String

Open Calculator

fx $V_w = \sqrt{\frac{T}{m}}$

ex $61\text{m/s} = \sqrt{\frac{186.05\text{N}}{0.05\text{kg/m}}}$

22) Wavelength given Frequency

Open Calculator

fx $\lambda = \frac{V_w}{f_w}$

ex $0.400052\text{m} = \frac{61\text{m/s}}{152.48\text{Hz}}$

23) Wavelength of Wave using Velocity

Open Calculator

fx $\lambda = V_w \cdot T_W$

ex $0.399916\text{m} = 61\text{m/s} \cdot 0.006556\text{s}$

Variables Used

- **A** Amplitude *(Meter)*
- **D** Total Distance Traveled *(Meter)*
- f_w Wave Frequency *(Hertz)*
- I_{ref} Reference Intensity *(Watt per Square Meter)*
- I_s Sound Intensity *(Watt per Square Meter)*
- **k** Wave Number
- **m** Mass per Unit Length *(Kilogram per Meter)*
- **Q** Loudness *(Decibel)*
- **T** Tension of String *(Newton)*
- T_W Time Period of Progressive Wave *(Second)*
- V_w Velocity of Wave *(Meter per Second)*
- λ Wavelength *(Meter)*
- ω_f 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: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Force** in Newton (N)
  Force Unit Conversion
- Measurement: **Frequency** in Hertz (Hz)
  Frequency 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/m²)
  Intensity 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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