Important Wave Properties and Equations Formulas PDF

Formulas
Examples
with Units

List of 23
Important Wave Properties and Equations Formulas

1) Wave Characteristics Formulas

1.1) Loudness Formula

Evaluate Formula

Formula

$$Q = 10 \cdot \log10\left(\frac{I_s}{I_{ref}}\right)$$

Example with Units

$$48.7506\,\text{dB} = 10 \cdot \log10\left(\frac{75\,\text{W/m}^2}{0.001\,\text{W/m}^2}\right)$$

1.2) Mass per Unit Length of String Formula

Evaluate Formula

Formula

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

Example with Units

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

1.3) Tension in String Formula

Evaluate Formula

Formula

$$T = V_w^{\,2} \cdot m$$

Example with Units

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

1.4) Wave Number Formula

Evaluate Formula

Formula

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

Example with Units

$$15.708 = \frac{2 \cdot 3.1416}{0.4\,\text{m}}$$

1.5) Wave Number using Angular Frequency Formula

Evaluate Formula

Formula

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

Example with Units

$$15.7049 = \frac{958\,\text{Hz}}{61\,\text{m/s}}$$

2) Wave Equations Formulas

2.1) Amplitude Formula

Evaluate Formula

Formula

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

Example with Units

$$0.3935\,\text{m} = \frac{60\,\text{m}}{152.48\,\text{Hz}}$$

2.2) Angular Frequency given Velocity Formula

Evaluate Formula

Formula

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

Example with Units

$$958.1858\,\text{Hz} = \frac{2 \cdot 3.1416 \cdot 61\,\text{m/s}}{0.4\,\text{m}}$$

2.3) Angular Frequency using Frequency Formula

Evaluate Formula

Formula

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

Example with Units

$$958.0601\,\text{Hz} = 2 \cdot 3.1416 \cdot 152.48\,\text{Hz}$$

2.4) Angular Frequency using Time Period Formula

Evaluate Formula

Formula

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

Example with Units

$$958.387\,\text{Hz} = \frac{2 \cdot 3.1416}{0.006556\,\text{s}}$$

2.5) Angular Frequency using Wave Number Formula

Evaluate Formula

Formula

$$\omega_f = k \cdot V_w$$

Example with Units

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

2.6) Frequency of Progressive Wave Formula

Evaluate Formula

Formula

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

Example with Units

$$152.4704\,\text{Hz} = \frac{958\,\text{Hz}}{2 \cdot 3.1416}$$

2.7) Frequency of Wave using Time Period Formula

Evaluate Formula

Formula

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

Example with Units

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

2.8) Frequency of Wavelength using Velocity Formula

Evaluate Formula

Formula

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

Example with Units

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

2.9) Time Period given Velocity Formula

Evaluate Formula

Formula

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

Example with Units

$$0.0066\,\text{s} = \frac{0.4\,\text{m}}{61\,\text{m/s}}$$

2.10) Time Period using Angular Frequency Formula

Evaluate Formula

Formula

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

Example with Units

$$0.0066\,\text{s} = \frac{2 \cdot 3.1416}{958\,\text{Hz}}$$

2.11) Time Period using Frequency Formula

Evaluate Formula

Formula

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

Example with Units

$$0.0066\,\text{s} = \frac{1}{152.48\,\text{Hz}}$$

2.12) Velocity of Progressive Wave Formula

Evaluate Formula

Formula

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

Example with Units

$$61.0128\,\text{m/s} = \frac{0.4\,\text{m}}{0.006556\,\text{s}}$$

2.13) Velocity of Progressive Wave given Angular Frequency Formula

Evaluate Formula

Formula

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

Example with Units

$$60.9882\,\text{m/s} = \frac{0.4\,\text{m} \cdot 958\,\text{Hz}}{2 \cdot 3.1416}$$

2.14) Velocity of Progressive Wave using Frequency Formula

Evaluate Formula

Formula

$$V_w = \lambda \cdot f_w$$

Example with Units

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

2.15) Velocity of Wave given Wave Number Formula

Evaluate Formula

Formula

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

Example with Units

$$61.0191\,\text{m/s} = \frac{958\,\text{Hz}}{15.7}$$

2.16) Velocity of Wave in String Formula

Evaluate Formula

Formula

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

Example with Units

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

2.17) Wavelength given Frequency Formula

Evaluate Formula

Formula

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

Example with Units

$$0.4001\,\text{m} = \frac{61\,\text{m/s}}{152.48\,\text{Hz}}$$

2.18) Wavelength of Wave using Velocity Formula

Evaluate Formula

Formula

$$\lambda = V_w \cdot T_W$$

Example with Units

$$0.3999\,\text{m} = 61\,\text{m/s} \cdot 0.006556\,\text{s}$$

Variables used in list of Wave Properties and Equations Formulas above

- **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 in list of Wave Properties and Equations Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- Functions: **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.*
- Functions: **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*

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