# Important Wavelength Formulas PDF

Formulas
Examples
with Units

**List of 14**
**Important Wavelength Formulas**

## 1) Deepwater Wavelength given Celerity of Deepwater Wave Formula

Evaluate Formula

Formula

$$\lambda_o = \frac{C_o^2 \cdot 2 \cdot \pi}{[g]}$$

Example with Units

$$12.9743\,\text{m} = \frac{4.5\,\text{m/s}^2 \cdot 2 \cdot 3.1416}{9.8066\,\text{m/s}^2}$$

## 2) Deepwater Wavelength given Deepwater Celerity Formula

Evaluate Formula

Formula

$$\lambda_o = \frac{\lambda \cdot C_o}{C}$$

Example with Units

$$12.9986\,\text{m} = \frac{10.11\,\text{m} \cdot 4.5\,\text{m/s}}{3.5\,\text{m/s}}$$

## 3) Deepwater Wavelength given Units of Feet Formula

Evaluate Formula

Formula

$$\lambda_{ft} = 5.12 \cdot T^2$$

Example with Units

$$151.1811\,\text{ft} = 5.12 \cdot 3\,\text{s}^2$$

## 4) Deepwater Wavelength given Wave Celerity Formula

Evaluate Formula

Formula

$$\lambda_o = C_o \cdot T$$

Example with Units

$$13.5\,\text{m} = 4.5\,\text{m/s} \cdot 3\,\text{s}$$

## 5) Deepwater Wavelength when SI systems Units of meters is Considered Formula

Evaluate Formula

Formula

$$\lambda_o = 1.56 \cdot T^2$$

Example with Units

$$14.04\,\text{m} = 1.56 \cdot 3\,\text{s}^2$$

## 6) Eckert's Equation for Wavelength Formula

Evaluate Formula

Formula

$$\lambda = \lambda_o \cdot \sqrt{\tanh\left(\frac{2 \cdot \pi \cdot d}{\lambda_o}\right)}$$

Example with Units

$$10.3564\,\text{m} = 13\,\text{m} \cdot \sqrt{\tanh\left(\frac{2 \cdot 3.1416 \cdot 1.55\,\text{m}}{13\,\text{m}}\right)}$$

## 7) Long Wave Simplification for Wavelength Formula

Evaluate Formula

Formula

$$\lambda = T \cdot \sqrt{[g] \cdot d}$$

Example with Units

$$11.6963\,\text{m} = 3\,\text{s} \cdot \sqrt{9.8066\,\text{m/s}^2 \cdot 1.55\,\text{m}}$$

## 8) Water Depth given Wave Celerity and Wavelength Formula

Evaluate Formula

Formula

$$d = \frac{\lambda \cdot \operatorname{atanh}\left(\frac{2 \cdot \pi \cdot C}{[g] \cdot T}\right)}{2 \cdot \pi}$$

Example with Units

$$1.5564\,\text{m} = \frac{10.11\,\text{m} \cdot \operatorname{atanh}\left(\frac{2 \cdot 3.1416 \cdot 3.5\,\text{m/s}}{9.8066\,\text{m/s}^2 \cdot 3\,\text{s}}\right)}{2 \cdot 3.1416}$$

## 9) Wavelength as Function of Depth and Wave Period Formula

Evaluate Formula

Formula

$$\lambda = \left(\frac{[g] \cdot T^2}{2 \cdot \pi}\right) \cdot \tanh\left(k \cdot d\right)$$

Example with Units

$$14.047\,\text{m} = \left(\frac{9.8066\,\text{m/s}^2 \cdot 3\,\text{s}^2}{2 \cdot 3.1416}\right) \cdot \tanh\left(5 \cdot 1.55\,\text{m}\right)$$

## 10) Wavelength as Function of Water Depth and Wave Period Formula

Evaluate Formula

Formula

$$\lambda = \left(\frac{[g] \cdot T}{\omega}\right) \cdot \tanh\left(k \cdot d\right)$$

Example with Units

$$11.768\,\text{m} = \left(\frac{9.8066\,\text{m/s}^2 \cdot 3\,\text{s}}{2.5\,\text{rad/s}}\right) \cdot \tanh\left(5 \cdot 1.55\,\text{m}\right)$$

## 11) Wavelength given Deepwater Celerity and Deepwater Wavelength Formula

Evaluate Formula

Formula

$$\lambda = \frac{\lambda_o \cdot C}{C_o}$$

Example with Units

$$10.1111\,\text{m} = \frac{13\,\text{m} \cdot 3.5\,\text{m/s}}{4.5\,\text{m/s}}$$

## 12) Wavelength given Deepwater Wavelength Formula

Evaluate Formula

Formula

$$\lambda = \lambda_o \cdot \tanh\left(k \cdot d\right)$$

Example with Units

$$13\,\text{m} = 13\,\text{m} \cdot \tanh\left(5 \cdot 1.55\,\text{m}\right)$$

## 13) Wavelength given Wave Celerity Formula

Evaluate Formula

Formula

$$\lambda = C \cdot T$$

Example with Units

$$10.5\,\text{m} = 3.5\,\text{m/s} \cdot 3\,\text{s}$$

## 14) Wavelength given Wave Celerity and Wave Speed Formula

Evaluate Formula

Formula

$$\lambda = \frac{2 \cdot \pi \cdot d}{\operatorname{atanh}\left(\frac{2 \cdot C \cdot \pi}{[g] \cdot T}\right)}$$

Example with Units

$$10.0687\,\text{m} = \frac{2 \cdot 3.1416 \cdot 1.55\,\text{m}}{\operatorname{atanh}\left(\frac{2 \cdot 3.5\,\text{m/s} \cdot 3.1416}{9.8066\,\text{m/s}^2 \cdot 3\,\text{s}}\right)}$$

## Variables used in list of Wavelength Formulas above

- **C** Wave Celerity *(Meter per Second)*
- $C_o$ Deepwater Wave Celerity *(Meter per Second)*
- **d** Water Depth *(Meter)*
- **k** Wave Number
- **T** Wave Period *(Second)*
- **λ** Wavelength *(Meter)*
- $\lambda_{ft}$ DeepWater Wavelength in Feet *(Foot)*
- $\lambda_o$ DeepWater Wavelength *(Meter)*
- **ω** Wave Angular Frequency *(Radian per Second)*

## Constants, Functions, Measurements used in list of Wavelength Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288
  *Archimedes' constant*
- constant(s): **[g]**, 9.80665
  *Gravitational acceleration on Earth*
- Functions: **atanh**, atanh(Number)
  *The inverse hyperbolic tangent function returns the value whose hyperbolic tangent is a number.*
- 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.*
- Functions: **tanh**, tanh(Number)
  *The hyperbolic tangent function (tanh) is a function that is defined as the ratio of the hyperbolic sine function (sinh) to the hyperbolic cosine function (cosh).*
- Measurement: **Length** in Meter (m), Foot (ft)
  *Length Unit Conversion*
- Measurement: **Time** in Second (s)
  *Time Unit Conversion*
- Measurement: **Speed** in Meter per Second (m/s)
  *Speed Unit Conversion*
- Measurement: **Angular Frequency** in Radian per Second (rad/s)
  *Angular Frequency Unit Conversion*

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