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Wave Parameters Formulas

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List of 18 Wave Parameters Formulas

Wave Parameters

1) Angular of Radian Frequency of Wave

Open Calculator

fx $$\omega = 2 \cdot \frac{\pi}{P}$$

ex $$6.10018\text{rad/s} = 2 \cdot \frac{\pi}{1.03}$$

2) Eckart's Equation for Wavelength

Open Calculator

fx $$\lambda = \left(\left([g] \cdot \frac{P^2}{2} \cdot \pi \right) \cdot \sqrt{\frac{\tanh(4 \cdot \pi^2 \cdot d)}{P^2} \cdot [g]} \right)$$

ex $$49.68647\text{m} = \left(\left([g] \cdot \frac{(1.03)^2}{2} \cdot \pi \right) \cdot \sqrt{\frac{\tanh(4 \cdot \pi^2 \cdot 0.91\text{m})}{(1.03)^2} \cdot [g]} \right)$$

3) Elevation of Water Surface Relative to SWL

Open Calculator

fx $$\eta = a \cdot \cos(\theta)$$

ex $$1.351\text{m} = 1.56\text{m} \cdot \cos(30^\circ)$$

4) Major Horizontal Semi-Axis given wavelength, Wave Height and Water Depth

Open Calculator

fx $$A = \left(\frac{H}{2}\right) \cdot \frac{\cosh\left(2 \cdot \pi \cdot \frac{D_{Z+d}}{\lambda}\right)}{\sinh\left(2 \cdot \pi \cdot \frac{d}{\lambda}\right)}$$

ex $$7.758974 = \left(\frac{3\text{m}}{2}\right) \cdot \frac{\cosh\left(2 \cdot \pi \cdot \frac{2\text{m}}{26.8\text{m}}\right)}{\sinh\left(2 \cdot \pi \cdot \frac{0.91\text{m}}{26.8\text{m}}\right)}$$

5) Maximum Wave Steepness for Waves Travelling

Open Calculator

fx $$\varepsilon_s = 0.142 \cdot \tanh\left(2 \cdot \pi \cdot \frac{d}{\lambda}\right)$$

ex $$0.029844 = 0.142 \cdot \tanh\left(2 \cdot \pi \cdot \frac{0.91\text{m}}{26.8\text{m}}\right)$$

6) Minor Vertical Semi-Axis given Wavelength, Wave Height and Water Depth

Open Calculator

fx $$B = \left(\frac{H}{2}\right) \cdot \frac{\sinh\left(2 \cdot \pi \cdot \frac{D_{Z+d}}{\lambda}\right)}{\sinh\left(2 \cdot \pi \cdot \frac{d}{\lambda}\right)}$$

ex $$3.393043 = \left(\frac{3\text{m}}{2}\right) \cdot \frac{\sinh\left(2 \cdot \pi \cdot \frac{2\text{m}}{26.8\text{m}}\right)}{\sinh\left(2 \cdot \pi \cdot \frac{0.91\text{m}}{26.8\text{m}}\right)}$$

7) Phase Velocity or Wave Celerity

Open Calculator

fx $$C = \frac{\lambda}{P}$$

ex $$26.01942\text{m/s} = \frac{26.8\text{m}}{1.03}$$

8) Phase Velocity or Wave Celerity given Radian Frequency and Wavenumber

Open Calculator

fx $$C = \frac{\omega}{k}$$

ex $$26.95652\text{m/s} = \frac{6.2\text{rad/s}}{0.23}$$

9) Radian Frequency given Wave Celerity

Open Calculator

fx $$\omega = C \cdot k$$

ex $$5.5315\text{rad/s} = 24.05\text{m/s} \cdot 0.23$$

10) Water Depth for Maximum Wave Steepness of Waves Travelling

Open Calculator

fx $$d = \lambda \cdot a \frac{\tanh\left(\frac{\varepsilon_s}{0.142}\right)}{2 \cdot \pi}$$

ex $$0.914909\text{m} = 26.8\text{m} \cdot a \frac{\tanh\left(\frac{0.03}{0.142}\right)}{2 \cdot \pi}$$

11) Wave Amplitude

Open Calculator

fx $$a = \frac{H}{2}$$

ex $$1.5\text{m} = \frac{3\text{m}}{2}$$

12) Wave Amplitude given Elevation of Water Surface Relative to SWL

Open Calculator

fx $$a = \frac{\eta}{\cos(\theta)}$$

ex $$0.207846\text{m} = \frac{0.18\text{m}}{\cos(30^\circ)}$$

13) Wave Height given Maximum Wave Steepness Limit by Michell

Open Calculator

fx $$H = \lambda \cdot 0.142$$

ex $$3.8056\text{m} = 26.8\text{m} \cdot 0.142$$

14) Wave Number given Wave Celerity

Open Calculator

fx $$k = \frac{\omega}{C}$$

ex $$0.257796 = \frac{6.2\text{rad/s}}{24.05\text{m/s}}$$

15) Wave number given wavelength

Open Calculator

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

ex $$0.234447 = 2 \cdot \frac{\pi}{26.8\text{m}}$$

16) Wave Steepness

Open Calculator

fx $$\varepsilon_s = \frac{H}{\lambda}$$

ex $$0.11194 = \frac{3\text{m}}{26.8\text{m}}$$

17) Wavelength for Maximum Wave Steepness

Open Calculator

fx $$\lambda = 2 \cdot \pi \cdot \frac{d}{a}\tanh\left(\frac{\varepsilon_s}{0.142}\right)$$

ex $$26.65621\text{m} = 2 \cdot \pi \cdot \frac{0.91\text{m}}{a}\tanh\left(\frac{0.03}{0.142}\right)$$

18) Wavelength given Maximum Wave Steepness Limit by Michell

Open Calculator

fx $$\lambda = \frac{H}{0.142}$$

ex $$21.12676\text{m} = \frac{3\text{m}}{0.142}$$

Variables Used

- **a** Wave Amplitude *(Meter)*
- **A** Horizontal Semi-axis of Water Particle
- **B** Vertical Semi-Axis
- **C** Celerity of The Wave *(Meter per Second)*
- **d** Water Depth *(Meter)*
- D_{Z+d} Distance above the Bottom *(Meter)*
- **H** Wave Height *(Meter)*
- **k** Wave Number
- **P** Wave Period
- ε_s Wave Steepness
- **η** Elevation of Water Surface *(Meter)*
- **θ** Theta *(Degree)*
- **λ** Wavelength *(Meter)*
- **ω** Wave Angular Frequency *(Radian per Second)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Constant: **[g]**, 9.80665
  Gravitational acceleration on Earth
- Function: **atanh**, atanh(Number)
  The inverse hyperbolic tangent function returns the value whose hyperbolic tangent is a number.
- Function: **cos**, cos(Angle)
  Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.
- Function: **cosh**, cosh(Number)
  The hyperbolic cosine function is a mathematical function that is defined as the ratio of the sum of the exponential functions of x and negative x to 2.
- Function: **sinh**, sinh(Number)
  The hyperbolic sine function, also known as the sinh function, is a mathematical function that is defined as the hyperbolic analogue of the sine 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.
- Function: **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)
  Length Unit Conversion

- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Angular Frequency** in Radian per Second (rad/s)
  Angular Frequency Unit Conversion

Check other formula lists

- **Cnoidal Wave Theory Formulas**
- **Wave Parameters Formulas**
- **Zero-Crossing Method Formulas**

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