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Wave Height Formulas

Calculators! Examples! Conversions!

List of 20 Wave Height Formulas

Wave Height

1) Maximum Wave Height

Open Calculator

fx $$H_{max} = 1.86 \cdot H_s$$

ex $$120.9m = 1.86 \cdot 65m$$

2) Mean Wave Period given Maximum Wave Period

Open Calculator

fx $$T' = \frac{T_{max}}{\Delta}$$

ex $$14.66667s = \frac{88s}{6}$$

3) Significant Wave Height given Wave Period for North Sea

Open Calculator

fx $$H_s = \left(\frac{T_{NS}}{3.94}\right)^{\frac{1}{0.376}}$$

ex $$64.99959m = \left(\frac{18.93s}{3.94}\right)^{\frac{1}{0.376}}$$

4) Wave Height for Horizontal Component of Local Fluid Velocity

Open Calculator

fx $$H = u \cdot 2 \cdot \lambda \cdot \frac{\cosh\left(2 \cdot \pi \cdot \frac{d}{\lambda}\right)}{[g] \cdot T_p \cdot \cosh\left(2 \cdot \pi \cdot \frac{D_{Z+d}}{\lambda}\right) \cdot \cos(\theta)}$$

ex $$3.05399m = 50m/s \cdot 2 \cdot 26.8m \cdot \frac{\cosh\left(2 \cdot \pi \cdot \frac{0.9m}{26.8m}\right)}{[g] \cdot 95s \cdot \cosh\left(2 \cdot \pi \cdot \frac{2m}{26.8m}\right) \cdot \cos(30°)}$$

5) Wave Height for Horizontal Fluid Particle Displacement

Open Calculator

fx
$$H = \varepsilon \cdot (4 \cdot \pi \cdot \lambda) \cdot \frac{\cosh\left(2 \cdot \pi \cdot \frac{D}{\lambda}\right)}{[g] \cdot T_h^2} \cdot \left(\left(\cosh\left(2 \cdot \pi \cdot \frac{D_{Z+d}}{\lambda}\right)\right)\right) \cdot \sin(\theta)$$

ex
$$3.055555m = 1.55m \cdot (4 \cdot \pi \cdot 26.8m) \cdot \frac{\cosh\left(2 \cdot \pi \cdot \frac{12m}{26.8m}\right)}{[g] \cdot (9s)^2} \cdot \left(\left(\cosh\left(2 \cdot \pi \cdot \frac{2m}{26.8m}\right)\right)\right) \cdot \sin(30^\circ)$$

6) Wave Height for Local Fluid Particle Acceleration of Horizontal Component

Open Calculator

fx
$$H = \alpha_{x/y} \cdot \lambda \cdot \frac{\cosh\left(2 \cdot \pi \cdot \frac{D}{\lambda}\right)}{[g] \cdot \pi \cdot \cosh\left(2 \cdot \pi \cdot \frac{D_{Z+d}}{\lambda}\right) \cdot \sin(\theta)}$$

ex
$$2.747798m = 0.21m/s \cdot 26.8m \cdot \frac{\cosh\left(2 \cdot \pi \cdot \frac{12m}{26.8m}\right)}{[g] \cdot \pi \cdot \cosh\left(2 \cdot \pi \cdot \frac{2m}{26.8m}\right) \cdot \sin(30^\circ)}$$

7) Wave Height for Local Fluid Particle Acceleration of Vertical Component

Open Calculator

fx
$$H = \left(\alpha_{x/y} \cdot \lambda \cdot \frac{\cosh\left(2 \cdot \pi \cdot \frac{D}{\lambda}\right)}{[g] \cdot \pi \cdot \sinh\left(2 \cdot \pi \cdot \frac{D_{Z+d}}{\lambda}\right) \cdot \cos(\theta)}\right)$$

ex
$$3.627765m = \left(0.21m/s \cdot 26.8m \cdot \frac{\cosh\left(2 \cdot \pi \cdot \frac{12m}{26.8m}\right)}{[g] \cdot \pi \cdot \sinh\left(2 \cdot \pi \cdot \frac{2m}{26.8m}\right) \cdot \cos(30^\circ)}\right)$$

8) Wave Height for Major Horizontal Semi-Axis given Wavelength

Open Calculator

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

ex
$$2.564334m = 6.707 \cdot 2 \cdot \frac{\sinh\left(2 \cdot \pi \cdot \frac{0.9m}{26.8m}\right)}{\cosh\left(2 \cdot \pi \cdot \frac{2m}{26.8m}\right)}$$

9) Wave Height for Minor Vertical Semi-Axis given Wavelength

Open Calculator

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

ex $$2.561704\text{m} = 2.93 \cdot 2 \cdot \frac{\sinh\left(2 \cdot \pi \cdot \frac{0.9\text{m}}{26.8\text{m}}\right)}{\sinh\left(2 \cdot \pi \cdot \frac{2\text{m}}{26.8\text{m}}\right)}$$

10) Wave Height for Simplified Horizontal Fluid Particle Displacement

Open Calculator

fx $$H = \varepsilon \cdot 2 \cdot \frac{\sinh\left(2 \cdot \pi \cdot \frac{D}{\lambda_{hp}}\right)}{\cosh\left(2 \cdot \pi \cdot \frac{D_{Z+d}}{\lambda_{hp}}\right)} \cdot \sin(\theta)$$

ex $$3.023927\text{m} = 1.55\text{m} \cdot 2 \cdot \frac{\sinh\left(2 \cdot \pi \cdot \frac{12\text{m}}{52.1\text{m}}\right)}{\cosh\left(2 \cdot \pi \cdot \frac{2\text{m}}{52.1\text{m}}\right)} \cdot \sin(30^\circ)$$

11) Wave Height for Simplified Vertical Fluid Particle Displacement

Open Calculator

fx $$H = \varepsilon' \cdot 2 \cdot \frac{\sinh\left(2 \cdot \pi \cdot \frac{D}{\lambda_{vp}}\right)}{\sinh\left(2 \cdot \pi \cdot \frac{D_{Z+d}}{\lambda_{vp}}\right)} \cdot \cos(\theta)$$

ex $$3.019906\text{m} = 0.22\text{m} \cdot 2 \cdot \frac{\sinh\left(2 \cdot \pi \cdot \frac{12\text{m}}{55.9\text{m}}\right)}{\sinh\left(2 \cdot \pi \cdot \frac{2\text{m}}{55.9\text{m}}\right)} \cdot \cos(30^\circ)$$

12) Wave Height for Vertical Component of Local Fluid Velocity

Open Calculator

fx $$H = (V_v \cdot 2 \cdot \lambda) \cdot \frac{\cosh\left(2 \cdot \pi \cdot \frac{D}{\lambda}\right)}{[g] \cdot T_p \cdot \sinh\left(2 \cdot \pi \cdot \frac{D_{Z+d}}{\lambda}\right) \cdot \sin(\theta)}$$

ex $$3.011975\text{m} = (1.522\text{m/s} \cdot 2 \cdot 26.8\text{m}) \cdot \frac{\cosh\left(2 \cdot \pi \cdot \frac{12\text{m}}{26.8\text{m}}\right)}{[g] \cdot 95\text{s} \cdot \sinh\left(2 \cdot \pi \cdot \frac{2\text{m}}{26.8\text{m}}\right) \cdot \sin(30^\circ)}$$

13) Wave Height for Vertical Fluid Particle Displacement

Open Calculator

fx $$H' = \varepsilon \cdot (4 \cdot \pi \cdot \lambda) \cdot \frac{\cosh\left(2 \cdot \pi \cdot \frac{D}{\lambda}\right)}{[g] \cdot T_p^2 \cdot \sinh\left(2 \cdot \pi \cdot \frac{D_{Z+d}}{\lambda}\right) \cdot \cos(\theta)}$$

ex $$0.117129\text{m} = 1.55\text{m} \cdot (4 \cdot \pi \cdot 26.8\text{m}) \cdot \frac{\cosh\left(2 \cdot \pi \cdot \frac{12\text{m}}{26.8\text{m}}\right)}{[g] \cdot (95\text{s})^2 \cdot \sinh\left(2 \cdot \pi \cdot \frac{2\text{m}}{26.8\text{m}}\right) \cdot \cos(30^\circ)}$$

14) Wave Height given Wave Amplitude

Open Calculator

fx $$H = 2 \cdot a$$

ex $$3.12\text{m} = 2 \cdot 1.56\text{m}$$

15) Wave Height given Wave Period for Mediterranean Sea

Open Calculator

fx $$H = \left(\frac{T_{ms} - 4}{2}\right)^{\frac{1}{0.7}}$$

ex $$3.084432\text{m} = \left(\frac{8.40\text{s} - 4}{2}\right)^{\frac{1}{0.7}}$$

16) Wave Height given Wave Period for North Atlantic Ocean

Open Calculator

fx $$H = \frac{T_{NS}}{2.5}$$

ex $$7.572\text{m} = \frac{18.93\text{s}}{2.5}$$

17) Wave Height given Wave Steepness

Open Calculator

fx $$H = \varepsilon_s \cdot \lambda$$

ex $$3.216\text{m} = 0.12 \cdot 26.8\text{m}$$

18) Wave Height Represented by Rayleigh Distribution

Open Calculator

fx $$H_{iw} = \left(\frac{2 \cdot H}{H_{rms}^2}\right) \cdot \exp\left(-\left(\frac{H^2}{H_{rms}^2}\right)\right)$$

ex $$0.244677\text{m} = \left(\frac{2 \cdot 3\text{m}}{(2.9\text{m})^2}\right) \cdot \exp\left(-\left(\frac{(3\text{m})^2}{(2.9\text{m})^2}\right)\right)$$

19) Wave Height Represented by Rayleigh Distribution under Narrow Band Condition

Open Calculator

fx $$H_{iw} = -\left(1 - \exp\left(\frac{H^2}{H_{rms}^2}\right)\right)$$

ex $$1.91583\text{m} = -\left(1 - \exp\left(\frac{(3\text{m})^2}{(2.9\text{m})^2}\right)\right)$$

20) Wavelength given Wave Steepness

Open Calculator

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

ex $$25\text{m} = \frac{3\text{m}}{0.12}$$

Variables Used

- **a** Wave Amplitude *(Meter)*
- **A** Horizontal Semi-axis of Water Particle
- **B** Vertical Semi-Axis
- **d** Depth of Water Wave *(Meter)*
- **D** Water Depth *(Meter)*
- D_{Z+d} Distance above Bottom *(Meter)*
- **H** Wave Height *(Meter)*
- **H'** Wave Height for Vertical Fluid Particle *(Meter)*
- H_{iw} Individual Wave Height *(Meter)*
- H_{max} Maximum Wave Height *(Meter)*
- H_{rms} Root Mean Square Wave Height *(Meter)*
- H_s Significant Wave Height *(Meter)*
- **T'** Mean Wave Period *(Second)*
- T_h Wave Period for Horizontal Fluid Particle *(Second)*
- T_{max} Maximum Wave Period *(Second)*
- T_{ms} Wave Period for Mediterranean Sea *(Second)*
- T_{NS} Wave Period for North Sea *(Second)*
- T_p Wave Period *(Second)*
- **u** Water Particle Velocity *(Meter per Second)*
- V_v Vertical Component of Velocity *(Meter per Second)*
- $\alpha_{x/y}$ Local Fluid Particle Acceleration *(Meter per Second)*
- **Δ** Coefficient Eckman
- **ε** Fluid Particle Displacement *(Meter)*
- **ε'** Particle Displacement *(Meter)*
- ε_s Wave Steepness
- **θ** Phase Angle *(Degree)*
- **λ** Wavelength *(Meter)*
- λ_{hp} Wavelength of Horizontal Fluid Particle *(Meter)*
- λ_{vp} Wavelength of Vertical Fluid Particle *(Meter)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Constant: **[g]**, 9.80665
  Gravitational acceleration on Earth
- 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: **exp**, exp(Number)
  n an exponential function, the value of the function changes by a constant factor for every unit change in the independent variable.
- Function: **sin**, sin(Angle)
  Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.
- 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.
- 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: **Angle** in Degree (°)
  Angle Unit Conversion

Check other formula lists

- Cnoidal Wave Theory Formulas
- Horizontal and Vertical Semi-Axis of Ellipse Formulas
- Parametric Spectrum Models Formulas
- Solitary Wave Formulas
- Subsurface Pressure Formulas
- Wave Celerity Formulas
- Wave Energy Formulas
- Wave Height Formulas
- Wave Parameters Formulas
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