



Return Period and Encounter Probability Formulas

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Examples!

Conversions!

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List of 9 Return Period and Encounter Probability Formulas

Return Period and Encounter Probability

1) Cumulative Probability of Design Significant Wave Height given Return Period

$$ext{PH}_{
m s} = -igg(igg(rac{
m t}{
m T_r}igg) - 1igg)$$

Open Calculator 🗗

$$\boxed{0.4 = -\left(\left(\frac{30}{50}\right) - 1\right)}$$

2) Encounter Probability

$$ext{P}_{ ext{e}} = 1 - \left(1 - \left(rac{ ext{t}}{ ext{T}_{ ext{r}}}
ight)
ight)^{ ext{L}}$$

Open Calculator 🖒

$$= 2.941604 = 1 - \left(1 - \left(\frac{30}{50}\right)\right)^{3.1}$$

3) Mean Value of Maximum Monthly Wind Speeds for Wind Speed with ryear Return Period

Open Calculator

$$\overline{\mathrm{U}_{\mathrm{m}} = \mathrm{U}_{\mathrm{r}} - (0.78 \cdot \sigma_{\mathrm{m}} \cdot (\ln(12 \cdot \mathrm{T_{\mathrm{r}}}) - 0.577))}$$





4) Return Period given Cumulative Probability

 $\mathbf{T}_{\mathbf{r}} = \frac{\mathbf{t}}{1 - \mathsf{PH}_{\mathbf{r}}}$

Open Calculator

 $\boxed{\mathbf{ex}} \boxed{50 = \frac{30}{1 - 0.4}}$

5) Significant Wave Height for Free Long Waves

 $\mathbf{H}_{\mathrm{sf}} = rac{\mathrm{K}\cdot\mathrm{H}_{\mathrm{s}}^{1.11}\cdot\mathrm{T}_{\mathrm{p}}^{1.25}}{\mathrm{D}^{0.25}}$

Open Calculator

 $= \frac{16.57771 \text{m} = \frac{0.0041 \cdot (65 \text{m})^{1.11} \cdot (31 \text{s})^{1.25}}{(12 \text{m})^{0.25}}$

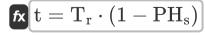
6) Standard Deviation of Maximum Monthly Wind Speeds given Wind Speed with r-year Return Period

 $\sigma_{
m m} = rac{
m U_r - U_m}{0.78 \cdot (\ln(12 \cdot
m T_r) - 0.577)}$

Open Calculator

 $oxed{\mathbf{ex}} 3.326324 = rac{32.6 ext{m/s} - 17.50 ext{m/s}}{0.78 \cdot (\ln(12 \cdot 50) - 0.577)}$

7) Time Interval Associated with Each Data Point given Return Period



Open Calculator

 $\boxed{\textbf{ex}} \left[30 = 50 \cdot (1-0.4) \right]$

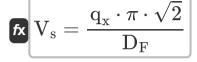






8) Velocity at Surface given Volume Flow Rate Per Unit of Ocean Width

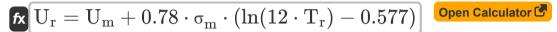




Open Calculator

$$oxed{ex} 0.499824 ext{m/s} = rac{13.5 ext{m}^3/ ext{s} \cdot \pi \cdot \sqrt{2}}{120 ext{m}}$$

9) Wind Speed with r-year Return Period 🗗



 $(2.57129 \text{m/s} = 17.50 \text{m/s} + 0.78 \cdot 3.32 \cdot (\ln(12 \cdot 50) - 0.577))$



Variables Used

- **D** Water Depth (Meter)
- D_F Depth of Frictional Influence (Meter)
- H_s Significant Wave Height (Meter)
- H_{Sf} Significant Wave Height for Free Waves (Meter)
- K Constant for Free Long Waves
- L Desired Time Period
- Pe Encounter Probability
- PHs Cumulative Probability
- **q**_x Volume Flow Rates per unit of Ocean Width (Cubic Meter per Second)
- t Time Interval associated with each Data Point
- T_D Design Wave Period (Second)
- Tr Return Period of Wind
- U_m Mean Value of Maximum Monthly Wind Speeds (Meter per Second)
- Ur Wind Speed with r Year Return Period (Meter per Second)
- Velocity at the Surface (Meter per Second)
- ullet σ_m Standard Deviation of Maximum Monthly Wind Speeds





Constants, Functions, Measurements used

- Constant: pi, 3.14159265358979323846264338327950288
 Archimedes' constant
- Function: In, In(Number)

 The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural 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: Volumetric Flow Rate in Cubic Meter per Second (m³/s)

 Volumetric Flow Rate Unit Conversion





Check other formula lists

 Return Period and Encounter Probability Formulas

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