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# Zero-Crossing Method Formulas

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## List of 12 Zero-Crossing Method Formulas

### Zero-Crossing Method ↗

#### 1) Number of Crests in Wave Record given Wave Crest Period ↗

$$fx \quad N_c = \frac{T_r}{T_c}$$

[Open Calculator ↗](#)

$$ex \quad 18.04124 = \frac{70s}{3.88s}$$

#### 2) Number of Zero Up-Crossings given Zero-Crossing Period ↗

$$fx \quad N_z = \frac{T_r}{T_z}$$

[Open Calculator ↗](#)

$$ex \quad 10 = \frac{70s}{7s}$$

#### 3) Probability that Wave Height is Greater than or Equal to Design Wave Height ↗

$$fx \quad p = \frac{m}{4}$$

[Open Calculator ↗](#)

$$ex \quad 0.5 = \frac{2}{4/m}$$



## 4) Probability that Wave Height is Lesser than or Equal to Design Wave Height ↗

**fx**  $p = 1 - \left( \frac{m}{4} \right)$

[Open Calculator ↗](#)

**ex**  $0.5 = 1 - \left( \frac{2}{4/m} \right)$

## 5) Record Length given Wave Crest Period ↗

**fx**  $T_r = T_c \cdot N_c$

[Open Calculator ↗](#)

**ex**  $69.84\text{s} = 3.88\text{s} \cdot 18$

## 6) Record Length given Zero-Crossing Period ↗

**fx**  $T_r = T_z \cdot N_z$

[Open Calculator ↗](#)

**ex**  $70\text{s} = 7\text{s} \cdot 10$

## 7) Root Mean Square Surface Elevation given Significant Wave Height ↗

**fx**  $\eta_{rms} = \frac{H_s}{4}$

[Open Calculator ↗](#)

**ex**  $16.25\text{m} = \frac{65\text{m}}{4}$



## 8) Significant Wave Height given rms Surface Elevation ↗

**fx**  $H_s = 4 \cdot \eta_{rms}$

[Open Calculator ↗](#)

**ex**  $64m = 4 \cdot 16m$

## 9) Significant Wave Height given Zero-th Moment ↗

**fx**  $H_s = 4 \cdot \sqrt{m_0}$

[Open Calculator ↗](#)

**ex**  $65.11528m = 4 \cdot \sqrt{265}$

## 10) Wave Crest Period ↗

**fx**  $T_c = \frac{T_r}{N_c}$

[Open Calculator ↗](#)

**ex**  $3.888889s = \frac{70s}{18}$

## 11) Zero-Crossing Period ↗

**fx**  $T_z = \frac{T_r}{N_z}$

[Open Calculator ↗](#)

**ex**  $7s = \frac{70s}{10}$



**12) Zero-th Moment given Significant Wave Height ↗**

**fx** 
$$m_0 = \left( \frac{H_s}{4} \right)^2$$

**Open Calculator ↗**

**ex** 
$$264.0625 = \left( \frac{65m}{4} \right)^2$$



## Variables Used

- $f$  Wave Number (*1 per Meter*)
- $H_s$  Significant Wave Height (*Meter*)
- $m$  Number of Waves Higher than Design Wave Height
- $m_0$  Zero-th Moment of Wave Spectrum
- $N_c$  Number of Crests
- $N_z$  Number of Zero-Upcrossings
- $p$  Probability
- $T_c$  Wave Crest Period (*Second*)
- $T_r$  Record Length (*Second*)
- $T_z$  Zero-Crossing Period (*Second*)
- $\eta_{rms}$  RMS Surface Elevation (*Meter*)



# Constants, Functions, Measurements used

- **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:** **Wave Number** in 1 per Meter (1/m)

*Wave Number Unit Conversion* 



## Check other formula lists

- Zero-Crossing Method  
Formulas 

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