



Group Velocity, Beats, Energy Transport Formulas

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Examples!

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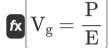




List of 9 Group Velocity, Beats, Energy Transport Formulas

Group Velocity, Beats, Energy Transport

1) Group Velocity given Wave Power per unit Crest Width



Open Calculator 🗗

$$\mathbf{ex} = 28.70813 \, \mathrm{m/s} = \frac{120 \, \mathrm{W}}{4.18 \, \mathrm{J}}$$

2) Group Velocity of Waves

fx

Open Calculator

$$oxed{V_{
m g} = 0.5 \cdot v \cdot \left(1 + \left(rac{k \cdot d}{\sinh(k \cdot d) \cdot \cosh(k \cdot d)}
ight)
ight)}$$

ex

$$\overline{28.66436 ext{m/s}} = 0.5 \cdot 50 ext{m/s} \cdot \left(1 + \left(rac{0.2 \cdot 10 ext{m}}{\sinh(0.2 \cdot 10 ext{m}) \cdot \cosh(0.2 \cdot 10 ext{m})}
ight)
ight)$$

3) Radian Frequency given Wave Propagation

$$\omega = \mathbf{k} \cdot \mathbf{x}$$

Open Calculator

ex
$$6.2 \mathrm{rad/s} = 0.2 \cdot 31$$





4) Surface Elevation

 $\eta = \left(rac{H_{
m w}}{2}
ight) \cdot \cos(({
m k}\cdot {
m x}) - (\omega \cdot t))$

Open Calculator 🗗

 $\mathbf{ex} = 0.476143 \text{m} = \left(\frac{3 \text{m}}{2}\right) \cdot \cos((0.2 \cdot 31) - (6.2 \text{rad/s} \cdot 16 \text{s}))$

5) Total Energy per unit Area given Wave Power per unit Crest Width

 $\mathbb{E} = \frac{P}{V_{\sigma}}$

st width

Open Calculator

= $4.18702 \mathrm{J} = rac{120 \mathrm{W}}{28.66 \mathrm{m/s}}$

6) Wave Power per unit Crest Width

 $extbf{fx} extbf{P} = extbf{E} \cdot extbf{V}_{ ext{g}}$

Open Calculator 🗗

7) Wave Speed

 $\mathbf{fx} v = \frac{\omega}{k}$

Open Calculator

 $50 {
m m/s} = rac{6.2 {
m rad/s}}{0.124}$



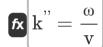


8) Wave Speed given Group Velocity

 $v = rac{V_{
m g}}{0.5 \cdot \left(1 + \left(rac{ ext{k} \cdot ext{d}}{ ext{sinh}(ext{k} \cdot ext{d}) \cdot ext{cosh}(ext{k} \cdot ext{d})}
ight)}$

Open Calculator 🗗

9) Wavenumber given Wave Speed



$$ex 0.124 = \frac{6.2 \mathrm{rad/s}}{50 \mathrm{m/s}}$$



Variables Used

- **d** Coastal Mean Depth (Meter)
- E Total Energy Per Unit Area (Joule)
- Hw Wave Height for Surface Gravity Waves (Meter)
- k Wave Number for Water Wave
- **k**" Wave Number
- P Wave Power Per Unit Crest Width (Watt)
- t Time (Second)
- **v** Wave Speed (Meter per Second)
- V_q Group Velocity of Waves (Meter per Second)
- X Propagation of Wave in One Direction
- **η** Surface Elevation (Meter)
- **ω** Wave Angular Frequency (Radian per Second)





Constants, Functions, Measurements used

- 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.
- 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: Energy in Joule (J)
 Energy Unit Conversion
- Measurement: Power in Watt (W)
 Power Unit Conversion
- Measurement: Angular Frequency in Radian per Second (rad/s)
 Angular Frequency Unit Conversion





Check other formula lists

- Group Velocity, Beats, Energy
 Transport Formulas
- Linear Dispersion Relation of Linear Wave Formulas
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