Buoyancy And Floatation Formulas

List of 24 Buoyancy And Floatation Formulas

Buoyancy And Floatation

Buoyancy Force and Center of Buoyancy

1) Buoyancy Force given Volume of Vertical Prism

Open Calculator

fx $F_{Buoyant} = \omega \cdot V$

ex $44566.83\text{N} = 75537\text{N/m}^3 \cdot 0.59\text{m}^3$

2) Buoyant Force on Entire Submerged Body

Open Calculator

fx $F_{Buoyant} = \omega \cdot V$

ex $44566.83\text{N} = 75537\text{N/m}^3 \cdot 0.59\text{m}^3$

3) Buoyant Force on Vertical Prism

Open Calculator

fx $F_{Buoyant} = \omega \cdot H_{Pressurehead} \cdot A$

ex $44944.51\text{N} = 75537\text{N/m}^3 \cdot 0.7\text{m} \cdot 0.85\text{m}^2$

4) Buoyant Force when Body Floats at between two Immiscible Fluids of Specific Weights

Open Calculator

fx $F_{Buoyant} = (\omega \cdot v_1 + \omega_1 \cdot v_2)$

ex $53523.54\text{N} = (75537\text{N/m}^3 \cdot 0.001\text{m}^3\text{/kg} + 65500\text{N/m}^3 \cdot 0.816\text{m}^3\text{/kg})$

5) Cross Sectional Area of Prism given Buoyancy Force

Open Calculator

fx
$$A = \frac{F_{Buoyant}}{\omega \cdot H_{Pressurehead}}$$

ex
$$0.837433\text{m}^2 = \frac{44280\text{N}}{75537\text{N/m}^3 \cdot 0.7\text{m}}$$

6) Cross Sectional Area of Prism given Volume of Vertical Prism dV

Open Calculator

fx
$$A = \frac{V}{H_{Pressurehead}}$$

ex
$$0.842857\text{m}^2 = \frac{0.59\text{m}^3}{0.7\text{m}}$$

7) Pressure Head Difference given Buoyancy Force

Open Calculator

fx
$$H_{Pressurehead} = \frac{F_{Buoyant}}{\omega \cdot A}$$

ex
$$0.68965\text{m} = \frac{44280\text{N}}{75537\text{N/m}^3 \cdot 0.85\text{m}^2}$$

8) Pressure Head Difference given Volume of Vertical Prism dV

Open Calculator

fx
$$H_{Pressurehead} = \frac{V}{A}$$

ex
$$0.694118\text{m} = \frac{0.59\text{m}^3}{0.85\text{m}^2}$$

9) Specific Weight pf Fluid given Buoyancy Force

Open Calculator

fx $$\omega = \frac{F_{Buoyant}}{H_{Pressurehead} \cdot A}$$

ex $$74420.17\mathrm{N/m^3} = \frac{44280\mathrm{N}}{0.7\mathrm{m} \cdot 0.85\mathrm{m^2}}$$

10) Total Buoyant Force given Volumes of Elementary Prism Submerged in Fluids

Open Calculator

fx $$F_{Buoyant} = (\omega \cdot v_1 + \omega_1 \cdot v_2)$$

ex $$53523.54\mathrm{N} = (75537\mathrm{N/m^3} \cdot 0.001\mathrm{m^3/kg} + 65500\mathrm{N/m^3} \cdot 0.816\mathrm{m^3/kg})$$

11) Volume of Submerged Body given Buoyant Force on Entire Submerged Body

Open Calculator

fx $$V = \frac{F_{Buoyant}}{\omega}$$

ex $$0.586203\mathrm{m^3} = \frac{44280\mathrm{N}}{75537\mathrm{N/m^3}}$$

12) Volume of Vertical Prism

Open Calculator

fx $$V = H_{Pressurehead} \cdot A$$

ex $$0.595\mathrm{m^3} = 0.7\mathrm{m} \cdot 0.85\mathrm{m^2}$$

Determination of Metacentric Height

13) Angle Made by Pendulum

Open Calculator

fx $$\theta = a\tan\left(\frac{d}{l}\right)$$

ex $$71.56505° = a\tan\left(\frac{150\text{m}}{50\text{m}}\right)$$

14) Distance Moved by Pendulum on Horizontal scale

Open Calculator

fx $$d = l \cdot \tan(\theta)$$

ex $$149.4342\text{m} = 50\text{m} \cdot \tan(71.5°)$$

15) Length of Plumb Line

Open Calculator

fx $$l = \frac{d}{\tan(\theta)}$$

ex $$50.1893\text{m} = \frac{150\text{m}}{\tan(71.5°)}$$

Metacentric Height for Floating Bodies Containing liquid

16) Distance between Centre of Gravity of these Wedges

Open Calculator

fx $$z = \frac{m}{\omega \cdot V}$$

ex $$1.121911\text{m} = \frac{50000\text{N*m}}{75537\text{N/m}^3 \cdot 0.59\text{m}^3}$$

17) Moment of Turning Couple due to Movement of Liquid

Open Calculator

fx $$m = (\omega \cdot V \cdot z)$$

ex $$46795.17\text{N*m} = (75537\text{N/m}^3 \cdot 0.59\text{m}^3 \cdot 1.05\text{m})$$

18) Volume of either Wedge

Open Calculator

fx $$V = \frac{m}{\omega \cdot z}$$

ex $$0.630407\text{m}^3 = \frac{50000\text{N*m}}{75537\text{N/m}^3 \cdot 1.05\text{m}}$$

Stability of Submerged and Floating Bodies

19) Restoring Couple when Floating Body in Stable Equilibrium

Open Calculator

fx
$$R_{\text{Restoring Couple}} = \left(W_{\text{body}} \cdot x \cdot \left(D \cdot \left(\frac{180}{\pi}\right)\right)\right)$$

ex
$$12960\text{N*m} = \left(18\text{N} \cdot 8\text{m} \cdot \left(90^\circ \cdot \left(\frac{180}{\pi}\right)\right)\right)$$

20) Righting Couple when Floating Body in Unstable Equilibrium

Open Calculator

fx
$$R_{\text{Righting Couple}} = \left(W_{\text{body}} \cdot x \cdot \left(D \cdot \left(\frac{180}{\pi}\right)\right)\right)$$

ex
$$12960\text{N*m} = \left(18\text{N} \cdot 8\text{m} \cdot \left(90^\circ \cdot \left(\frac{180}{\pi}\right)\right)\right)$$

21) Weight of Body given Restoring Couple

Open Calculator

fx
$$W_{\text{body}} = \frac{R_{\text{Restoring Couple}}}{x \cdot \left(D \cdot \left(\frac{180}{\pi}\right)\right)}$$

ex
$$18\text{N} = \frac{12960\text{N*m}}{8\text{m} \cdot \left(90^\circ \cdot \left(\frac{180}{\pi}\right)\right)}$$

22) Weight of Body given Righting Couple

Open Calculator

$$W_{body} = \frac{R_{Righting\ Couple}}{x \cdot \left(D \cdot \left(\frac{180}{\pi}\right)\right)}$$

$$18.00139\text{N} = \frac{12961\text{N*m}}{8\text{m} \cdot \left(90^\circ \cdot \left(\frac{180}{\pi}\right)\right)}$$

Time Period of Transverse Oscillation of a Floating Body

23) Radius of Gyration of Body given Time Period

Open Calculator

$$k_G = \sqrt{\left(\left(\frac{T}{2 \cdot \pi}\right)^2\right) \cdot ([g] \cdot GM)}$$

$$0.10385\text{m} = \sqrt{\left(\left(\frac{5.38\text{s}}{2 \cdot \pi}\right)^2\right) \cdot ([g] \cdot 0.0015\text{m})}$$

24) Time Period of One Complete Oscillations

Open Calculator

$$T = 2 \cdot \pi \cdot \left(\frac{k_G^2}{[g] \cdot GM}\right)^{\frac{1}{2}}$$

$$5.439553\text{s} = 2 \cdot \pi \cdot \left(\frac{(0.105\text{m})^2}{[g] \cdot 0.0015\text{m}}\right)^{\frac{1}{2}}$$

Variables Used

- **A** Cross-Sectional Area of Body *(Square Meter)*
- **d** Distance Moved *(Meter)*
- **D** Angle Between Bodies *(Degree)*
- $F_{Buoyant}$ Buoyant Force *(Newton)*
- **GM** Metacentric Height *(Meter)*
- $H_{Pressurehead}$ Difference in Pressure Head *(Meter)*
- k_G Radius of Gyration of Body *(Meter)*
- **l** Length of Plumb Line *(Meter)*
- **m** Moment of turning Couple *(Newton Meter)*
- $R_{Restoring\ Couple}$ Restoring Couple *(Newton Meter)*
- $R_{Righting\ Couple}$ Righting Couple *(Newton Meter)*
- **T** Time Period of Rolling *(Second)*
- **V** Volume of Body *(Cubic Meter)*
- W_{body} Weight of Body *(Newton)*
- **x** Distance from submerged to Floating Body *(Meter)*
- **z** Distance between Center of Gravity of these Wedges *(Meter)*
- **θ** Tiltting Angle of Body *(Degree)*
- v_1 Specific Volume at Point 1 *(Cubic Meter per Kilogram)*
- v_2 Specific Volume at Point 2 *(Cubic Meter per Kilogram)*
- **ω** Specific Weight of body *(Newton per Cubic Meter)*
- $ω_1$ Specific Weight 2 *(Newton per Cubic Meter)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Constant: **[g]**, 9.80665 Meter/Second²
  Gravitational acceleration on Earth
- Function: **atan**, atan(Number)
  Inverse trigonometric tangent function
- Function: **sqrt**, sqrt(Number)
  Square root function
- Function: **tan**, tan(Angle)
  Trigonometric tangent function
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Time** in Second (s)
  Time Unit Conversion
- Measurement: **Volume** in Cubic Meter (m³)
  Volume Unit Conversion
- Measurement: **Area** in Square Meter (m²)
  Area Unit Conversion
- Measurement: **Force** in Newton (N)
  Force Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Torque** in Newton Meter (N*m)
  Torque Unit Conversion
- Measurement: **Specific Volume** in Cubic Meter per Kilogram (m³/kg)
  Specific Volume Unit Conversion

- Measurement: **Moment of Force** in Newton Meter (N*m)
  Moment of Force Unit Conversion
- Measurement: **Specific Weight** in Newton per Cubic Meter (N/m^3)
  Specific Weight Unit Conversion

Check other formula lists

- Buoyancy And Floatation Formulas
- Culverts Formulas
- Equations of Motion and Energy Equation Formulas
- Flow of Compressible Fluids Formulas
- Flow Over Notches and Weirs Formulas
- Fluid Pressure and Its Measurement Formulas
- Fundamentals of Fluid Flow Formulas
- Hydroelectric Power Generation Formulas
- Hydrostatic Forces on Surfaces Formulas
- Impact of Free Jets Formulas
- Impulse Momentum Equation And Its Applications Formulas
- Liquids in Relative Equilibrium Formulas
- Most Economical or Most Efficient Section of Channel Formulas
- Non-uniform Flow in Channels Formulas
- Properties of Fluid Formulas
- Thermal Expansion of Pipe and Pipe Stresses Formulas
- Uniform Flow in Channels Formulas
- Water Power Engineering Formulas

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