Important Pressure Relations Formulas PDF

Formulas
Examples
with Units

List of 30
Important Pressure Relations Formulas

1) Absolute Pressure at Height h Formula

Evaluate Formula

Formula

$$P_{abs} = P'_a + y_l \cdot h_a$$

Example with Units

$$101110.6\,\text{Pa} = 101000\,\text{Pa} + 9.85\,\text{N/m}^3 \cdot 1122.843\,\text{cm}$$

2) Angle of Inclined Manometer given Pressure at Point Formula

Evaluate Formula

Formula

$$\Theta = asin\left(\frac{P_a}{\gamma_1 \cdot L}\right)$$

Example with Units

$$89.9598° = asin\left(\frac{6\,\text{Pa}}{1342\,\text{N/m}^3 \cdot 0.447094\,\text{cm}}\right)$$

3) Area of Surface Wetted given Center of Pressure Formula

Evaluate Formula

Formula

$$A_w = \frac{I}{\left(h^* - D\right) \cdot D}$$

Example with Units

$$14.3838\,\text{m}^2 = \frac{3.56\,\text{kg·m}^2}{\left(100\,\text{cm} - 45\,\text{cm}\right) \cdot 45\,\text{cm}}$$

4) Bulk Modulus given Velocity of Pressure Wave Formula

Evaluate Formula

Formula

$$K = C^2 \cdot \rho$$

Example with Units

$$363715.57\,\text{Pa} = 19.1\,\text{m/s}^2 \cdot 997\,\text{kg/m}^3$$

5) Center of Pressure Formula

Evaluate Formula

Formula

$$h^* = D + \frac{I}{A_w \cdot D}$$

Example with Units

$$100\,\text{cm} = 45\,\text{cm} + \frac{3.56\,\text{kg·m}^2}{14.38384\,\text{m}^2 \cdot 45\,\text{cm}}$$

6) Center of Pressure on Inclined Plane Formula

Evaluate Formula

Formula

$$h^* = D + \frac{I \cdot \sin(\Theta) \cdot \sin(\Theta)}{A_w \cdot D}$$

Example with Units

$$100\,\text{cm} = 45\,\text{cm} + \frac{3.56\,\text{kg·m²} \cdot \sin(89.95976°) \cdot \sin(89.95976°)}{14.38384\,\text{m²} \cdot 45\,\text{cm}}$$

7) Density of Liquid given Dynamic Pressure Formula

Evaluate Formula

Formula

$$LD = 2 \cdot \frac{P_d}{u_F^2}$$

Example with Units

$$0.1768\,\text{kg/m³} = 2 \cdot \frac{13.2\,\text{Pa}}{12.21998\,\text{m/s}^2}$$

8) Depth of Centroid given Center of Pressure Formula

Evaluate Formula

Formula

$$D = \frac{h^* \cdot S_W + \sqrt{\left(h^* \cdot S_W\right)^2 + 4 \cdot S_W \cdot I}}{2 \cdot S_W}$$

Example with Units

$$100.1185\,\text{cm} = \frac{100\,\text{cm} \cdot 3000\,\text{m²} + \sqrt{\left(100\,\text{cm} \cdot 3000\,\text{m²}\right)^2 + 4 \cdot 3000\,\text{m²} \cdot 3.56\,\text{kg·m²}}}{2 \cdot 3000\,\text{m²}}$$

9) Diameter of Droplet given Change in Pressure Formula

Evaluate Formula

Formula

$$d = 4 \cdot \frac{\sigma_c}{\Delta p}$$

Example with Units

$$6.1932\,\text{cm} = 4 \cdot \frac{1.0164\,\text{N/m}}{65.646\,\text{Pa}}$$

10) Diameter of Soap Bubble Formula

Evaluate Formula

Formula

$$d_b = \frac{8 \cdot \sigma_c}{\Delta p}$$

Example with Units

$$12.3864\,\text{cm} = \frac{8 \cdot 1.0164\,\text{N/m}}{65.646\,\text{Pa}}$$

11) Differential Pressure between Two Points Formula

Evaluate Formula

Formula

$$\Delta p = \gamma_1 \cdot h_1 - \gamma_2 \cdot h_2$$

Example with Units

$$65.646\,\text{Pa} = 1342\,\text{N/m³} \cdot 12\,\text{cm} - 1223\,\text{N/m³} \cdot 7.8\,\text{cm}$$

12) Differential Pressure-Differential Manometer Formula

Evaluate Formula

Formula

$$\Delta p = \gamma_2 \cdot h_2 + \gamma_m \cdot h_m - \gamma_1 \cdot h_1$$

Example with Units

$$65.6461\,\text{Pa} = 1223\,\text{N/m}^3 \cdot 7.8\,\text{cm} + 2387.129\,\text{N/m}^3 \cdot 5.5\,\text{cm} - 1342\,\text{N/m}^3 \cdot 12\,\text{cm}$$

13) Dynamic Pressure Head-Pitot Tube Formula

Evaluate Formula

Formula

$$h_d = \frac{u_F^2}{2 \cdot g}$$

Example with Units

$$761.8771\,\text{cm} = \frac{12.21998\,\text{m/s}^2}{2 \cdot 9.8\,\text{m/s}^2}$$

14) Dynamic Pressure of Fluid Formula

Evaluate Formula

Formula

$$P_d = \frac{LD \cdot u_F^2}{2}$$

Example with Units

$$13.2\,\text{Pa} = \frac{0.176792\,\text{kg/m}^3 \cdot 12.21998\,\text{m/s}^2}{2}$$

15) Height of Fluid 1 given Differential Pressure between Two Points Formula

Evaluate Formula

Formula

$$h_1 = \frac{\Delta p + \gamma_2 \cdot h_2}{\gamma_1}$$

Example with Units

$$12\,\text{cm} = \frac{65.646\,\text{Pa} + 1223\,\text{N/m}^3 \cdot 7.8\,\text{cm}}{1342\,\text{N/m}^3}$$

16) Height of Fluid 2 given Differential Pressure between Two Points Formula

Evaluate Formula

Formula

$$h_2 = \frac{\gamma_1 \cdot h_1 - \Delta p}{\gamma_2}$$

Example with Units

$$7.8\,\text{cm} = \frac{1342\,\text{N/m}^3 \cdot 12\,\text{cm} - 65.646\,\text{Pa}}{1223\,\text{N/m}^3}$$

17) Height of Liquid given its Absolute Pressure Formula

Evaluate Formula

Formula

$$h_a = \frac{P_{abs} - P'_a}{y_l}$$

Example with Units

$$1122.8426\,\text{cm} = \frac{101110.6\,\text{Pa} - 101000\,\text{Pa}}{9.85\,\text{N/m}^3}$$

18) Length of Inclined Manometer Formula

Evaluate Formula

Formula

$$L = \frac{P_a}{\gamma_1 \cdot \sin(\theta)}$$

Example with Units

$$0.4471\,\text{cm} = \frac{6\,\text{Pa}}{1342\,\text{N/m}^3 \cdot \sin(89.95976°)}$$

19) Mass Density given Velocity of Pressure Wave Formula

Evaluate Formula

Formula

$$\rho = \frac{K}{C^2}$$

Example with Units

$$997.0001\,\text{kg/m}^3 = \frac{363715.6\,\text{Pa}}{19.1\,\text{m/s}^2}$$

20) Moment of Inertia of Centroid given Center of Pressure Formula

Evaluate Formula

Formula

$$I = \left(h^* - D\right) \cdot A_w \cdot D$$

Example with Units

$$3.56\,\text{kg·m}^2 = \left(100\,\text{cm} - 45\,\text{cm}\right) \cdot 14.38384\,\text{m}^2 \cdot 45\,\text{cm}$$

21) Pressure in Excess of Atmospheric Pressure Formula

Evaluate Formula

Formula

$$P_e = y \cdot h$$

Example with Units

$$120.8838\,\text{Pa} = 9.812\,\text{N/m}^3 \cdot 1232\,\text{cm}$$

22) Pressure in Liquid Droplet Formula

Evaluate Formula

Formula

$$P_l = 4 \cdot \frac{\sigma}{d}$$

Example with Units

$$4698.6881\,\text{Pa} = 4 \cdot \frac{72.75\,\text{N/m}}{6.193218\,\text{cm}}$$

23) Pressure in Liquid Jet Formula

Evaluate Formula

Formula

$$P = 2 \cdot \frac{\sigma}{d_j}$$

Example with Units

$$5.7715\,\text{Pa} = 2 \cdot \frac{72.75\,\text{N/m}}{2521\,\text{cm}}$$

24) Pressure Inside Liquid Drop Formula

Evaluate Formula

Formula

$$P_l = \frac{4 \cdot \sigma}{d}$$

Example with Units

$$4698.6881\,\text{Pa} = \frac{4 \cdot 72.75\,\text{N/m}}{6.193218\,\text{cm}}$$

25) Pressure Inside Soap Bubble Formula

Evaluate Formula

Formula

$$P_l = \frac{8 \cdot \sigma}{d_b}$$

Example with Units

$$4698.6866\,\text{Pa} = \frac{8 \cdot 72.75\,\text{N/m}}{12.38644\,\text{cm}}$$

26) Pressure using Inclined Manometer Formula

Evaluate Formula

Formula

$$P_a = \gamma_1 \cdot L \cdot \sin\left(\Theta\right)$$

Example with Units

$$6\,\text{Pa} = 1342\,\text{N/m}^3 \cdot 0.447094\,\text{cm} \cdot \sin\left(89.95976°\right)$$

27) Pressure Wave Velocity in Fluids Formula

Evaluate Formula

Formula

$$C = \sqrt{\frac{K}{\rho}}$$

Example with Units

$$19.1\,\text{m/s} = \sqrt{\frac{363715.6\,\text{Pa}}{997\,\text{kg/m}^3}}$$

28) Surface Tension of Liquid Drop given Change in Pressure Formula

Evaluate Formula

Formula

$$\sigma_c = \Delta p \cdot \frac{d}{4}$$

Example with Units

$$1.0164\,\text{N/m} = 65.646\,\text{Pa} \cdot \frac{6.193218\,\text{cm}}{4}$$

29) Surface Tension of Soap Bubble Formula

Evaluate Formula

Formula

$$\sigma_c = \Delta p \cdot \frac{d_b}{8}$$

Example with Units

$$1.0164\,\text{N/m} = 65.646\,\text{Pa} \cdot \frac{12.38644\,\text{cm}}{8}$$

30) Velocity of Fluid given Dynamic Pressure Formula

Evaluate Formula

Formula

$$u_F = \sqrt{P_d \cdot \frac{2}{LD}}$$

Example with Units

$$12.22\,\text{m/s} = \sqrt{13.2\,\text{Pa} \cdot \frac{2}{0.176792\,\text{kg/m}^3}}$$

Variables used in list of Pressure Relations Formulas above

- A_w Wet Surface Area *(Square Meter)*
- **C** Velocity of Pressure Wave *(Meter per Second)*
- **d** Diameter of Droplet *(Centimeter)*
- **D** Depth of Centroid *(Centimeter)*
- d_b Diameter of Bubble *(Centimeter)*
- d_j Diameter of Jet *(Centimeter)*
- **g** Acceleration Due To Gravity *(Meter per Square Second)*
- **h** Height *(Centimeter)*
- h_1 Height of Column 1 *(Centimeter)*
- h_2 Height of Column 2 *(Centimeter)*
- h_a Height Absolute *(Centimeter)*
- h_d Dynamic Pressure Head *(Centimeter)*
- h_m Height of Manometer Liquid *(Centimeter)*
- h^* Center of Pressure *(Centimeter)*
- **I** Moment of Inertia *(Kilogram Square Meter)*
- **K** Bulk Modulus *(Pascal)*
- **L** Length of Inclined Manometer *(Centimeter)*
- **LD** Liquid Density *(Kilogram per Cubic Meter)*
- **P** Pressure in Liquid Jet *(Pascal)*
- P_a Pressure A *(Pascal)*
- P'_a Atmospheric Pressure *(Pascal)*
- P_{abs} Absolute Pressure *(Pascal)*
- P_d Dynamic Pressure *(Pascal)*
- P_e Excess Pressure *(Pascal)*
- P_l Liqude Pressure *(Pascal)*
- S_W Surface Area *(Square Meter)*
- u_F Fluid Velocity *(Meter per Second)*
- **y** Specific Weight of Liquid *(Newton per Cubic Meter)*
- y_l Specific Weight of Liquids *(Newton per Cubic Meter)*
- y_1 Specific Weight 1 *(Newton per Cubic Meter)*

Constants, Functions, Measurements used in list of Pressure Relations Formulas above

- Functions: **asin**, asin(Number)
  The inverse sine function, is a trigonometric function that takes a ratio of two sides of a right triangle and outputs the angle opposite the side with the given ratio.
- Functions: **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.
- Functions: **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 Centimeter (cm)
  Length Unit Conversion
- Measurement: **Area** in Square Meter (m²)
  Area Unit Conversion
- Measurement: **Pressure** in Pascal (Pa)
  Pressure Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Acceleration** in Meter per Square Second (m/s²)
  Acceleration Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Surface Tension** in Newton per Meter (N/m)
  Surface Tension Unit Conversion
- Measurement: **Mass Concentration** in Kilogram per Cubic Meter (kg/m³)
  Mass Concentration Unit Conversion
- Measurement: **Density** in Kilogram per Cubic Meter (kg/m³)
  Density Unit Conversion
- Measurement: **Moment of Inertia** in Kilogram Square Meter (kg·m²)
  Moment of Inertia Unit Conversion
- Measurement: **Specific Weight** in Newton per Cubic Meter (N/m³)

- γ_2 Specific Weight 2 *(Newton per Cubic Meter)*
- γ_m Specific Weight of Manometer liquid *(Newton per Cubic Meter)*
- Δp Pressure Changes *(Pascal)*
- Θ Angle *(Degree)*
- ρ Mass Density *(Kilogram per Cubic Meter)*
- σ Surface Tension *(Newton per Meter)*
- σ_c Change in Surface Tension *(Newton per Meter)*

Specific Weight Unit Conversion

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