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Pressure Relations Formulas

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List of 30 Pressure Relations Formulas

Pressure Relations

1) Absolute Pressure at Height h

Open Calculator

fx $$P_{abs} = P_{atm} + y_{liquid} \cdot h_{absolute}$$

ex $$101110.6\text{Pa} = 101000\text{Pa} + 9.85\text{N/m}^3 \cdot 1123\text{cm}$$

2) Angle of Inclined Manometer given Pressure at Point

Open Calculator

fx $$\Theta = a\sin\left(\frac{P_p}{\gamma_1} \cdot L\right)$$

ex $$5.823708^\circ = a\sin\left(\frac{801\text{Pa}}{1342\text{N/m}^3} \cdot 17\text{cm}\right)$$

3) Area of Surface Wetted given Center of Pressure

Open Calculator

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

ex $$14.38384\text{m}^2 = \frac{3.56\text{kg}\cdot\text{m}^2}{(100\text{cm} - 45\text{cm}) \cdot 45\text{cm}}$$

4) Bulk Modulus given Velocity of Pressure Wave

Open Calculator

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

ex $$363715.6\text{Pa} = (19.1\text{m/s})^2 \cdot 997\text{kg/m}^3$$

5) Center of Pressure

Open Calculator

fx $$h^* = D + \frac{I}{A_{wet} \cdot D}$$

ex $$1457.698\text{cm} = 45\text{cm} + \frac{3.56\text{kg·m}^2}{0.56\text{m}^2 \cdot 45\text{cm}}$$

6) Center of Pressure on Inclined Plane

Open Calculator

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

ex $$509.7635\text{cm} = 45\text{cm} + \frac{3.56\text{kg·m}^2 \cdot \sin(35^\circ) \cdot \sin(35^\circ)}{0.56\text{m}^2 \cdot 45\text{cm}}$$

7) Density of Liquid given Dynamic Pressure

Open Calculator

fx $$LD = 2 \cdot \frac{P_{dynamic}}{u_{Fluid}^2}$$

ex $$0.176792\text{kg/m}^3 = 2 \cdot \frac{13.2\text{Pa}}{(12.22\text{m/s})^2}$$

8) Depth of Centroid given Center of Pressure

Open Calculator

$$D = \frac{h^{\star} \cdot SA_{Wetted} + \sqrt{\left(h^{\star} \cdot SA_{Wetted}\right)^2 + 4 \cdot SA_{Wetted} \cdot I}}{2 \cdot SA_{Wetted}}$$

$$135.8878\text{cm} = \frac{100\text{cm} \cdot 7.3\text{m}^2 + \sqrt{(100\text{cm} \cdot 7.3\text{m}^2)^2 + 4 \cdot 7.3\text{m}^2 \cdot 3.56\text{kg·m}^2}}{2 \cdot 7.3\text{m}^2}$$

9) Diameter of Droplet given Change in Pressure

Open Calculator

$$d = 4 \cdot \frac{\sigma_{change}}{\Delta p}$$

$$9310.714\text{cm} = 4 \cdot \frac{78.21\text{N/m}}{3.36\text{Pa}}$$

10) Diameter of Soap Bubble

Open Calculator

$$d = \frac{8 \cdot \sigma_{change}}{\Delta p}$$

$$18621.43\text{cm} = \frac{8 \cdot 78.21\text{N/m}}{3.36\text{Pa}}$$

11) Differential Pressure between Two Points

Open Calculator

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

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

12) Differential Pressure-Differential Manometer

Open Calculator

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

ex $$-38.146\text{Pa} = 1223\text{N/m}^3 \cdot 7.8\text{cm} + 500\text{N/m}^3 \cdot 5.5\text{cm} - 1342\text{N/m}^3 \cdot 12\text{cm}$$

13) Dynamic Pressure Head-Pitot Tube

Open Calculator

fx $$h_d = \frac{u_{Fluid}^2}{2 \cdot g}$$

ex $$761.8796\text{cm} = \frac{(12.22\text{m/s})^2}{2 \cdot 9.8\text{m/s}^2}$$

14) Dynamic Pressure of Fluid

Open Calculator

fx $$P_{dynamic} = \frac{LD \cdot u_{Fluid}^2}{2}$$

ex $$1717.277\text{Pa} = \frac{23\text{kg/m}^3 \cdot (12.22\text{m/s})^2}{2}$$

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

Open Calculator

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

ex $$7.358718\text{cm} = \frac{3.36\text{Pa} + 1223\text{N/m}^3 \cdot 7.8\text{cm}}{1342\text{N/m}^3}$$

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

Open Calculator

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

ex $$12.89289\text{cm} = \frac{1342\text{N/m}^3 \cdot 12\text{cm} - 3.36\text{Pa}}{1223\text{N/m}^3}$$

17) Height of Liquid given its Absolute Pressure

Open Calculator

fx $$h_{absolute} = \frac{P_{abs} - P_{atm}}{\gamma}$$

ex $$351176\text{cm} = \frac{534000\text{Pa} - 101000\text{Pa}}{123.3\text{N/m}^3}$$

18) Length of Inclined Manometer

Open Calculator

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

ex $$0.779484\text{cm} = \frac{6\text{Pa}}{1342\text{N/m}^3 \cdot \sin(35^\circ)}$$

19) Mass Density given Velocity of Pressure Wave

Open Calculator

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

ex $$5.482306\text{kg/m}^3 = \frac{2000\text{Pa}}{(19.1\text{m/s})^2}$$

20) Moment of Inertia of Centroid given Center of Pressure

Open Calculator

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

$$0.1386\text{kg·m}^2 = (100\text{cm} - 45\text{cm}) \cdot 0.56\text{m}^2 \cdot 45\text{cm}$$

21) Pressure in Excess of Atmospheric Pressure

Open Calculator

$$P_{excess} = y \cdot h$$

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

22) Pressure in Liquid Droplet

Open Calculator

$$P_{excess} = 4 \cdot \frac{\sigma}{d}$$

$$240.4959\text{Pa} = 4 \cdot \frac{72.75\text{N/m}}{121\text{cm}}$$

23) Pressure in Liquid Jet

Open Calculator

$$P = 2 \cdot \frac{\sigma}{d_{jet}}$$

$$5.771519\text{Pa} = 2 \cdot \frac{72.75\text{N/m}}{2521\text{cm}}$$

24) Pressure Inside Liquid Drop

Open Calculator

fx $$\Delta p_{new} = \frac{4 \cdot \sigma}{d}$$

ex $$240.4959\text{Pa} = \frac{4 \cdot 72.75\text{N/m}}{121\text{cm}}$$

25) Pressure Inside Soap Bubble

Open Calculator

fx $$\Delta p_{new} = \frac{8 \cdot \sigma}{d}$$

ex $$480.9917\text{Pa} = \frac{8 \cdot 72.75\text{N/m}}{121\text{cm}}$$

26) Pressure using Inclined Manometer

Open Calculator

fx $$P_a = \gamma_1 \cdot L \cdot \sin(\Theta)$$

ex $$130.8557\text{Pa} = 1342\text{N/m}^3 \cdot 17\text{cm} \cdot \sin(35^\circ)$$

27) Pressure Wave Velocity in Fluids

Open Calculator

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

ex $$1.41634\text{m/s} = \sqrt{\frac{2000\text{Pa}}{997\text{kg/m}^3}}$$

28) Surface Tension of Liquid Drop given Change in Pressure

Open Calculator

fx $\sigma_{change} = \Delta p \cdot \frac{d}{4}$

ex $1.0164\text{N/m} = 3.36\text{Pa} \cdot \frac{121\text{cm}}{4}$

29) Surface Tension of Soap Bubble

Open Calculator

fx $\sigma_{change} = \Delta p \cdot \frac{d}{8}$

ex $0.5082\text{N/m} = 3.36\text{Pa} \cdot \frac{121\text{cm}}{8}$

30) Velocity of Fluid given Dynamic Pressure

Open Calculator

fx $u_{Fluid} = \sqrt{P_{dynamic} \cdot \frac{2}{LD}}$

ex $1.071366\text{m/s} = \sqrt{13.2\text{Pa} \cdot \frac{2}{23\text{kg/m}^3}}$

Variables Used

- **A_{wet}** Wet Surface Area *(Square Meter)*
- **C** Velocity of Pressure Wave *(Meter per Second)*
- **d** Diameter of Droplet *(Centimeter)*
- **D** Depth of Centroid *(Centimeter)*
- **d_{jet}** 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)*
- **$h_{absolute}$** 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_{abs}** Absolute Pressure *(Pascal)*
- **P_{atm}** Atmospheric Pressure *(Pascal)*
- **$P_{dynamic}$** Dynamic Pressure *(Pascal)*
- **P_{excess}** Pressure *(Pascal)*

- P_p Pressure on Point *(Pascal)*
- SA_{Wetted} Surface Area *(Square Meter)*
- u_{Fluid} Fluid Velocity *(Meter per Second)*
- y Specific Weight of Liquid *(Newton per Cubic Meter)*
- y_{liquid} Specific Weight of Liquids *(Newton per Cubic Meter)*
- γ Specific Weight *(Newton per Cubic Meter)*
- γ_1 Specific Weight 1 *(Newton per Cubic Meter)*
- γ_2 Specific Weight 2 *(Newton per Cubic Meter)*
- γ_m Specific Weight of Manometer liquid *(Newton per Cubic Meter)*
- Δp Pressure Changes *(Pascal)*
- Δp_{new} Pressure Change New *(Pascal)*
- Θ Angle *(Degree)*
- ρ Mass Density *(Kilogram per Cubic Meter)*
- σ Surface Tension *(Newton per Meter)*
- σ_{change} Surface Tensions *(Newton per Meter)*

Constants, Functions, Measurements used

- Function: **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.
- Function: **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.
- 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 Centimeter (cm)
  Length Unit Conversion
- Measurement: **Area** in Square Meter (m^2)
  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/s^2)
  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/m^3)
  Mass Concentration Unit Conversion
- Measurement: **Density** in Kilogram per Cubic Meter (kg/m^3)
  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)
  Specific Weight Unit Conversion

Check other formula lists

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