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# Drag and Forces Formulas

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# List of 11 Drag and Forces Formulas

## Drag and Forces

### 1) Area of body for Lift Force in body moving on Fluid

Open Calculator

$$A_p = \frac{F_L'}{C_L \cdot 0.5 \cdot \rho \cdot (v^2)}$$

$$1.888902\text{m}^2 = \frac{1100\text{N}}{0.94 \cdot 0.5 \cdot 1.21\text{kg/m}^3 \cdot \left((32\text{m/s})^2\right)}$$

### 2) Coefficient of drag for sphere in Oseen formula when Reynolds number is between 0.2 and 5

Open Calculator

$$C_D = \left(\frac{24}{Re}\right) \cdot \left(1 + \left(\frac{3}{16 \cdot Re}\right)\right)$$

$$0.0048 = \left(\frac{24}{5000}\right) \cdot \left(1 + \left(\frac{3}{16 \cdot 5000}\right)\right)$$

### 3) Coefficient of drag for sphere in stoke's law when Reynolds number is less than 0.2

Open Calculator

$$C_D = \frac{24}{Re}$$

$$0.0048 = \frac{24}{5000}$$

### 4) Drag Force for body moving in Fluid

Open Calculator

$$(F_D') = \frac{(C_D') \cdot A_p \cdot M_w \cdot (v)^2}{V_w \cdot 2}$$

$$175.3234\text{N} = \frac{0.15 \cdot 1.88\text{m}^2 \cdot 3.4\text{kg} \cdot (32\text{m/s})^2}{2.8\text{m}^3 \cdot 2}$$

### 5) Drag Force for body moving in Fluid of Certain Density

Open Calculator

$$(F_D') = (C_D') \cdot A_p \cdot \rho \cdot \frac{v^2}{2}$$

$$174.7046\text{N} = 0.15 \cdot 1.88\text{m}^2 \cdot 1.21\text{kg/m}^3 \cdot \frac{(32\text{m/s})^2}{2}$$

### 6) Force exerted by body on supersonic plane

Open Calculator

$$F = \left(\rho \cdot \left(\Delta L^2\right) \cdot \left(v^2\right)\right) \cdot \left(\frac{\mu_d}{\rho \cdot v \cdot \Delta L}\right) \cdot \left(\frac{K}{\rho \cdot v^2}\right)$$

ex

$$1269.499\text{N} = \left(1.21\text{kg/m}^3 \cdot \left((3277\text{m})^2\right) \cdot \left((32\text{m/s})^2\right)\right) \cdot \left(\frac{0.075\text{P}}{1.21\text{kg/m}^3 \cdot 32\text{m/s} \cdot 3277\text{m}}\right) \cdot \left(\frac{2000\text{Pa}}{1.21\text{kg/m}^3 \cdot (32\text{m}}\right.$$

### 7) Power Required to Keep Flat Plate in Motion

Open Calculator

$$P_w = (F_D') \cdot v$$

ex

$$5584\text{W} = 174.5\text{N} \cdot 32\text{m/s}$$

### 8) Pressure Drag from Total Drag Force on Sphere

Open Calculator

$$P_d = \pi \cdot \mu_d \cdot D \cdot v$$

ex

$$0.060319\text{N} = \pi \cdot 0.075\text{P} \cdot 0.08\text{m} \cdot 32\text{m/s}$$

### 9) Skin Friction Drag from Total Drag Force on Sphere

Open Calculator

$$F_{dragforce} = 2 \cdot \pi \cdot \mu_d \cdot D \cdot v$$

ex

$$0.120637\text{N} = 2 \cdot \pi \cdot 0.075\text{P} \cdot 0.08\text{m} \cdot 32\text{m/s}$$

### 10) Total Drag force on Sphere

Open Calculator

$$F_D = 3 \cdot \pi \cdot \mu_d \cdot D \cdot v$$

ex

$$0.180956\text{N} = 3 \cdot \pi \cdot 0.075\text{P} \cdot 0.08\text{m} \cdot 32\text{m/s}$$

### 11) Total force exerted by fluid on body

Open Calculator

$$F = \left((C_D') \cdot A_p \cdot \rho \cdot \frac{v^2}{2}\right) + \left(C_L \cdot A_p \cdot \rho \cdot \frac{v^2}{2}\right)$$

ex

$$1269.52\text{N} = \left(0.15 \cdot 1.88\text{m}^2 \cdot 1.21\text{kg/m}^3 \cdot \frac{(32\text{m/s})^2}{2}\right) + \left(0.94 \cdot 1.88\text{m}^2 \cdot 1.21\text{kg/m}^3 \cdot \frac{(32\text{m/s})^2}{2}\right)$$

## Variables Used

- $A_p$ Projected Area of Body *(Square Meter)*
- $C_D$ Coefficient of Drag for Sphere
- $C_D'$ Coefficient of Drag for Body in Fluid
- $C_L$ Lift Coefficient for Body in Fluid
- **D** Diameter of Sphere in Fluid *(Meter)*
- **F** Force *(Newton)*
- $F_D$ Total Drag Force on Sphere *(Newton)*
- $F_D'$ Drag Force on Body in Fluid *(Newton)*
- $F_{dragforce}$ Skin Friction Drag on Sphere *(Newton)*
- $F_L'$ Lift Force on Body in Fluid *(Newton)*
- **K** Bulk Modulus *(Pascal)*
- $M_w$ Mass of Flowing Fluid *(Kilogram)*
- $P_d$ Pressure Drag Force on Sphere *(Newton)*
- $P_w$ Power to Keep Plate in Motion *(Watt)*
- **Re** Reynolds Number
- **v** Velocity of Body or Fluid *(Meter per Second)*
- $V_w$ Volume of Flowing Fluid *(Cubic Meter)*
- **ΔL** Length of Aeroplane *(Meter)*
- $\mu_d$ Dynamic Viscosity of Fluid *(Poise)*
- **ρ** Density of Fluid Circulating *(Kilogram per Cubic Meter)*

## Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  *Archimedes' constant*
- Measurement: **Length** in Meter (m)
  *Length Unit Conversion*
- Measurement: **Weight** in Kilogram (kg)
  *Weight Unit Conversion*
- Measurement: **Volume** in Cubic Meter ($m^3$)
  *Volume 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: **Power** in Watt (W)
  *Power Unit Conversion*
- Measurement: **Force** in Newton (N)
  *Force Unit Conversion*
- Measurement: **Dynamic Viscosity** in Poise (P)
  *Dynamic Viscosity Unit Conversion*
- Measurement: **Density** in Kilogram per Cubic Meter ($kg/m^3$)
  *Density Unit Conversion*

## Check other formula lists

- **Drag and Forces Formulas**
- **Lift and Circulation Formulas**

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