calculatoratoz.com

unitsconverters.com

Lift and Circulation Formulas

Calculators! Examples! Conversions!

List of 16 Lift and Circulation Formulas

Lift and Circulation

1) Angle of Attack for Circulation developed on Airfoil

Open Calculator

fx $$\alpha = a\sin\left(\frac{\Gamma}{\pi \cdot U \cdot C}\right)$$

ex $$6.506912° = a\sin\left(\frac{62\text{m}^2/\text{s}}{\pi \cdot 81\text{m/s} \cdot 2.15\text{m}}\right)$$

2) Angle of Attack for Lift Coefficient on Airfoil

Open Calculator

fx $$\alpha = a\sin\left(\frac{C_{L\ \text{airfoil}}}{2 \cdot \pi}\right)$$

ex $$6.506638° = a\sin\left(\frac{0.712}{2 \cdot \pi}\right)$$

3) Chord Length for Circulation developed on Airfoil

Open Calculator

fx $$C = \frac{\Gamma}{\pi \cdot U \cdot \sin(\alpha)}$$

ex $$2.152276\text{m} = \frac{62\text{m}^2/\text{s}}{\pi \cdot 81\text{m/s} \cdot \sin(6.5°)}$$

4) Circulation developed on Airfoil

fx $\Gamma = \pi \cdot U \cdot C \cdot \sin(\alpha)$

Open Calculator

ex $61.93442\mathrm{m^2/s} = \pi \cdot 81\mathrm{m/s} \cdot 2.15\mathrm{m} \cdot \sin(6.5°)$

5) Circulation for Single Stagnation Point

fx $\Gamma_c = 4 \cdot \pi \cdot V_\infty \cdot R$

Open Calculator

ex $243.1593\mathrm{m^2/s} = 4 \cdot \pi \cdot 21.5\mathrm{m/s} \cdot 0.9\mathrm{m}$

6) Circulation in Location of Stagnation Points

fx $\Gamma_c = -(\sin(\theta)) \cdot 4 \cdot \pi \cdot V_\infty \cdot R$

Open Calculator

ex $243.1593\mathrm{m^2/s} = -(\sin(270°)) \cdot 4 \cdot \pi \cdot 21.5\mathrm{m/s} \cdot 0.9\mathrm{m}$

7) Coefficient of Lift for Airfoil

fx $C_{L\ airfoil} = 2 \cdot \pi \cdot \sin(\alpha)$

Open Calculator

ex $0.711277 = 2 \cdot \pi \cdot \sin(6.5°)$

8) Lift coefficient for lift force in body moving on fluid

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

Open Calculator

ex $$0.944451 = \frac{1100\mathrm{N}}{1.88\mathrm{m^2} \cdot 0.5 \cdot 1.21\mathrm{kg/m^3} \cdot \left((32\mathrm{m/s})^2\right)}$$

9) Lift Coefficient for Rotating Cylinder with Circulation

Open Calculator

fx $$C' = \frac{\Gamma_c}{R \cdot V_\infty}$$

ex $$12.55814 = \frac{243\text{m}^2/\text{s}}{0.9\text{m} \cdot 21.5\text{m/s}}$$

10) Lift Coefficient for Rotating Cylinder with Tangential Speed

Open Calculator

fx $$C' = \frac{2 \cdot \pi \cdot v_t}{V_\infty}$$

ex $$12.56637 = \frac{2 \cdot \pi \cdot 43\text{m/s}}{21.5\text{m/s}}$$

11) Lift Force for Body moving in Fluid

Open Calculator

fx $$(F_L') = \frac{C_L \cdot A_p \cdot M_w \cdot \left(v^2\right)}{V_w \cdot 2}$$

ex $$1098.693\text{N} = \frac{0.94 \cdot 1.88\text{m}^2 \cdot 3.4\text{kg} \cdot \left((32\text{m/s})^2\right)}{2.8\text{m}^3 \cdot 2}$$

12) Lift Force for body moving in Fluid of Certain Density

Open Calculator

fx $$F_L = C_L \cdot A_p \cdot \rho \cdot \frac{v^2}{2}$$

ex $$1094.816\text{N} = 0.94 \cdot 1.88\text{m}^2 \cdot 1.21\text{kg/m}^3 \cdot \frac{(32\text{m/s})^2}{2}$$

13) Lift Force on Cylinder for Circulation

Open Calculator

fx $$F_L = \rho \cdot I \cdot \Gamma_c \cdot V_\infty$$

ex $$53733.98\text{N} = 1.21\text{kg/m}^3 \cdot 8.5\text{m} \cdot 243\text{m}^2\text{/s} \cdot 21.5\text{m/s}$$

14) Radius of Cylinder for Lift Coefficient in Rotating Cylinder with Circulation

Open Calculator

fx $$R = \frac{\Gamma_c}{C' \cdot V_\infty}$$

ex $$0.900584\text{m} = \frac{243\text{m}^2\text{/s}}{12.55 \cdot 21.5\text{m/s}}$$

15) Tangential Velocity of Cylinder with Lift Coefficient

Open Calculator

fx $$v_t = \frac{C' \cdot V_\infty}{2 \cdot \pi}$$

ex $$42.94398\text{m/s} = \frac{12.55 \cdot 21.5\text{m/s}}{2 \cdot \pi}$$

16) Velocity of Airfoil for Circulation developed on Airfoil

Open Calculator

fx $$U = \frac{\Gamma}{\pi \cdot C \cdot \sin(\alpha)}$$

ex $$81.08576\text{m/s} = \frac{62\text{m}^2\text{/s}}{\pi \cdot 2.15\text{m} \cdot \sin(6.5°)}$$

Variables Used

- A_p Projected Area of Body *(Square Meter)*
- C Chord Length of Airfoil *(Meter)*
- $C_{L\ airfoil}$ Lift Coefficient for Airfoil
- C_L Lift Coefficient for Body in Fluid
- C' Lift Coefficient for Rotating Cylinder
- F_L Lift Force on Rotating Cylinder *(Newton)*
- F_L' Lift Force on Body in Fluid *(Newton)*
- l Length of Cylinder in Fluid Flow *(Meter)*
- M_w Mass of Flowing Fluid *(Kilogram)*
- R Radius of Rotating Cylinder *(Meter)*
- U Velocity of Airfoil *(Meter per Second)*
- v Velocity of Body or Fluid *(Meter per Second)*
- V_∞ Freestream Velocity of Fluid *(Meter per Second)*
- v_t Tangential Velocity of Cylinder in Fluid *(Meter per Second)*
- V_w Volume of Flowing Fluid *(Cubic Meter)*
- α Angle of Attack on Airfoil *(Degree)*
- Γ Circulation on Airfoil *(Square Meter per Second)*
- Γ_c Circulation Around Cylinder *(Square Meter per Second)*
- θ Angle at Stagnation Point *(Degree)*
- ρ Density of Fluid Circulating *(Kilogram per Cubic Meter)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- 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.
- 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: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Force** in Newton (N)
  Force Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Density** in Kilogram per Cubic Meter (kg/m^3)
  Density Unit Conversion

- Measurement: **Momentum Diffusivity** in Square Meter per Second (m^2/s)
  Momentum Diffusivity Unit Conversion

Check other formula lists

- **Lift and Circulation Formulas**

Feel free to SHARE this document with your friends!

PDF Available in

English Spanish French German Russian Italian Portuguese Polish Dutch

7/25/2024 | 10:59:55 AM UTC

Please leave your feedback here...