

Important Wheel Centre Rates for Independent Suspension Formulas PDF



Formulas
Examples
with Units

List of 12 Important Wheel Centre Rates for Independent Suspension Formulas

1) Area of Brake Lining Formula ↻

Formula

$$A_l = \frac{w \cdot r_b \cdot \alpha \cdot \pi}{180}$$

Example with Units

$$0.0028 \text{ m}^2 = \frac{0.19 \text{ m} \cdot 0.4 \text{ m} \cdot 120^\circ \cdot 3.1416}{180}$$

Evaluate Formula ↻

2) Assumed Initial Roll Rate given Required Anti-Roll Bar Rate Formula ↻

Formula

$$K_\Phi = \left(K_a + K_w \cdot \frac{a^2}{2} \right) \cdot \frac{K_t \cdot \frac{a^2}{2}}{K_t \cdot \frac{a^2}{2} + K_a + K_w \cdot \frac{a^2}{2}}$$

Evaluate Formula ↻

Example with Units

$$76693.2625 \text{ Nm/rad} = \left(89351 \text{ Nm/rad} + 35239 \text{ N/m} \cdot \frac{1.2 \text{ m}^2}{2} \right) \cdot \frac{321330 \text{ N/m} \cdot \frac{1.2 \text{ m}^2}{2}}{321330 \text{ N/m} \cdot \frac{1.2 \text{ m}^2}{2} + 89351 \text{ Nm/rad} + 35239 \text{ N/m} \cdot \frac{1.2 \text{ m}^2}{2}}$$

3) Brake Fluid Pressure Formula ↻

Formula

$$p = \frac{F_{cl}}{A}$$

Example with Units

$$16666.6667 \text{ N/m}^2 = \frac{500 \text{ N}}{0.03 \text{ m}^2}$$

Evaluate Formula ↻

4) Braking Efficiency Formula ↻

Formula

$$\eta = \left(\frac{F}{W} \right) \cdot 100$$

Example with Units

$$60 = \left(\frac{7800 \text{ N}}{13000 \text{ N}} \right) \cdot 100$$

Evaluate Formula ↻

5) Power Absorbed by Disc Brake Formula ↻

Formula

$$P_d = 2 \cdot p \cdot A_p \cdot \mu_p \cdot R_m \cdot n \cdot 2 \cdot n \cdot \frac{N}{60}$$

Evaluate Formula ↻

Example with Units

$$0.0061 \text{ W} = 2 \cdot 8 \text{ N/m}^2 \cdot 0.01 \text{ m}^2 \cdot 0.34 \cdot 0.25 \text{ m} \cdot 2.01 \cdot 2 \cdot 2.01 \cdot \frac{2001 \text{ /min}}{60}$$



6) Required Anti-Roll Bar Rate Formula

Formula

$$K_a = K_\Phi \cdot \frac{K_t \cdot \frac{a^2}{2}}{K_t \cdot \frac{a^2}{2} - K_\Phi} - K_w \cdot \frac{a^2}{2}$$

Evaluate Formula 

Example with Units

$$89350.4125 \text{ Nm/rad} = 76693 \text{ Nm/rad} \cdot \frac{321330 \text{ N/m} \cdot \frac{1.2 \text{ m}^2}{2}}{321330 \text{ N/m} \cdot \frac{1.2 \text{ m}^2}{2} - 76693 \text{ Nm/rad}} - 35239 \text{ N/m} \cdot \frac{1.2 \text{ m}^2}{2}$$

7) Ride Rate given Wheel Centre Rate Formula

Formula

$$K_r = \frac{K_t \cdot K_w}{K_t + K_w}$$

Example with Units

$$31756.4002 \text{ N/m} = \frac{321330 \text{ N/m} \cdot 35239 \text{ N/m}}{321330 \text{ N/m} + 35239 \text{ N/m}}$$

Evaluate Formula 

8) Tyre Rate given Required Anti-Roll Bar Rate Formula

Formula

$$K_t = \left(\frac{\left(K_a + K_w \cdot \frac{a^2}{2} \right) \cdot K_\Phi}{\left(K_a + K_w \cdot \frac{a^2}{2} \right) - K_\Phi} \right) \cdot \frac{2}{a}$$

Evaluate Formula 

Example with Units

$$321326.6816 \text{ N/m} = \left(\frac{\left(89351 \text{ Nm/rad} + 35239 \text{ N/m} \cdot \frac{1.2 \text{ m}^2}{2} \right) \cdot 76693 \text{ Nm/rad}}{\left(89351 \text{ Nm/rad} + 35239 \text{ N/m} \cdot \frac{1.2 \text{ m}^2}{2} \right) - 76693 \text{ Nm/rad}} \right) \cdot \frac{2}{1.2 \text{ m}}$$

9) Tyre Vertical Rate given Wheel Centre Rate Formula

Formula

$$K_t = \frac{K_w \cdot K_r}{K_w - K_r}$$

Example with Units

$$321329.9775 \text{ N/m} = \frac{35239 \text{ N/m} \cdot 31756.4 \text{ N/m}}{35239 \text{ N/m} - 31756.4 \text{ N/m}}$$

Evaluate Formula 

10) Wheel Centre Rate Formula

Formula

$$K_w = \frac{K_r \cdot K_t}{K_t - K_r}$$

Example with Units

$$35238.9997 \text{ N/m} = \frac{31756.4 \text{ N/m} \cdot 321330 \text{ N/m}}{321330 \text{ N/m} - 31756.4 \text{ N/m}}$$

Evaluate Formula 



11) Wheel Centre Rate given Required Anti-Roll Bar Rate Formula

Formula

Evaluate Formula 

$$K_w = \frac{K_\phi \cdot \frac{K_t \cdot \frac{a^2}{2}}{K_t \cdot \frac{a^2}{2} + K_\phi} - K_a}{\frac{a^2}{2}}$$

Example with Units

$$35238.1841 \text{ N/m} = \frac{76693 \text{ Nm/rad} \cdot \frac{321330 \text{ N/m} \cdot \frac{1.2 \text{ m}^2}{2}}{321330 \text{ N/m} \cdot \frac{1.2 \text{ m}^2}{2} + 76693 \text{ Nm/rad}} - 89351 \text{ Nm/rad}}{\frac{1.2 \text{ m}^2}{2}}$$

12) Work Done in Braking Formula

Formula

Example with Units

Evaluate Formula 

$$W_b = F \cdot S$$

$$156000 \text{ N} \cdot \text{m} = 7800 \text{ N} \cdot 20 \text{ m}$$



Variables used in list of Wheel Centre Rates for Independent Suspension Formulas above

- **a** Track Width of Vehicle (Meter)
- **A** Area of Master Cylinder Piston (Square Meter)
- **A_l** Area of Brake Lining (Square Meter)
- **A_p** Area of One Piston Per Caliper (Square Meter)
- **F** Braking Force on Brake Drum (Newton)
- **F_{cl}** Force Produced By Master Cylinder (Newton)
- **K_a** Required Anti Roll Bar Rate (Newton Meter per Radian)
- **K_r** Ride Rate (Newton per Meter)
- **K_t** Tyre Vertical Rate (Newton per Meter)
- **K_w** Wheel Centre Rate (Newton per Meter)
- **K_φ** Assumed Initial Roll Rate (Newton Meter per Radian)
- **n** Number of Caliper Units
- **N** Revolution of Discs Per Minute (1 Per Minute)
- **p** Line Pressure (Newton per Square Meter)
- **P** Brake Fluid Pressure (Newton per Square Meter)
- **P_d** Power Absorbed By Disc Brake (Watt)
- **r_b** Brake Drum Radius (Meter)
- **R_m** Mean Radius of Caliper Unit to Disc Axis (Meter)
- **S** Stopping Distance During Braking in Meters (Meter)
- **w** Brake Lining Width (Meter)
- **W** Weight of Vehicle (Newton)
- **W_b** Work Done in Braking (Newton Meter)
- **α** Angle Between Linings of Brake Shoes (Degree)
- **η** Braking Efficiency
- **μ_p** Coefficient of Friction of Pad Material

Constants, Functions, Measurements used in list of Wheel Centre Rates for Independent Suspension Formulas above

- **constant(s):** **pi**,
3.14159265358979323846264338327950288
Archimedes' constant
- **Measurement: Length** in Meter (m)
Length Unit Conversion 
- **Measurement: Area** in Square Meter (m²)
Area Unit Conversion 
- **Measurement: Pressure** in Newton per Square Meter (N/m²)
Pressure Unit Conversion 
- **Measurement: Power** in Watt (W)
Power Unit Conversion 
- **Measurement: Force** in Newton (N)
Force Unit Conversion 
- **Measurement: Angle** in Degree (°)
Angle Unit Conversion 
- **Measurement: Surface Tension** in Newton per Meter (N/m)
Surface Tension Unit Conversion 
- **Measurement: Torque** in Newton Meter (N*m)
Torque Unit Conversion 
- **Measurement: Torsion Constant** in Newton Meter per Radian (Nm/rad)
Torsion Constant Unit Conversion 
- **Measurement: Time Inverse** in 1 Per Minute (1/min)
Time Inverse Unit Conversion 



Download other Important Race Car Vehicle Dynamics PDFs

- [Important Rates for Axle Suspension in Race Car Formulas](#) 
- [Important Wheel Centre Rates for Independent Suspension Formulas](#) 
- [Important Ride Rate and Ride Frequency for Race Cars Formulas](#) 

Try our Unique Visual Calculators

-  [Percentage change](#) 
-  [LCM of two numbers](#) 
-  [Proper fraction](#) 

Please SHARE this PDF with someone who needs it!

This PDF can be downloaded in these languages

[English](#) [Spanish](#) [French](#) [German](#) [Russian](#) [Italian](#) [Portuguese](#) [Polish](#) [Dutch](#)

9/23/2024 | 11:42:58 AM UTC

