



# All Wheel Braking for Racing Car Formulas

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Examples!

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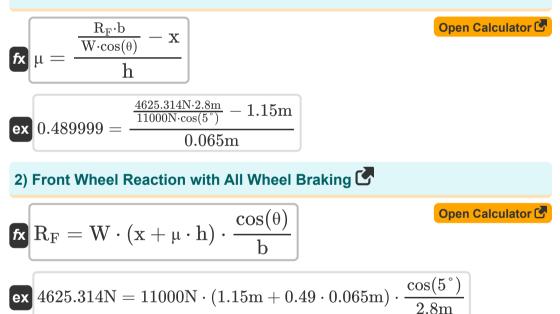


## List of 25 All Wheel Braking for Racing Car Formulas

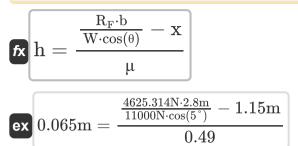
## All Wheel Braking for Racing Car 🕑

### Effects on Front Wheel 🕑

# 1) Friction Coefficient between Wheel and Road Surface with Front Wheel Brake



#### 3) Height of C.G. from Road Surface with Front Wheel Brake



### 4) Horizontal Distance of C.G from Rear Axle with Front Wheel Brake

fx 
$$\mathbf{x} = rac{\mathbf{R}_{\mathrm{F}} \cdot \mathbf{b}}{\mathbf{W} \cdot \cos(\theta)} - \mu \cdot \mathbf{h}$$

$$\overbrace{1.15m}{} = \frac{4625.314N \cdot 2.8m}{11000N \cdot \cos(5°)} - 0.49 \cdot 0.065m$$

#### 5) Slope of Road from Braking with Front Wheel Reaction 🕑

$$\begin{aligned} & \mathbf{fx} \ \theta = a \cos\left(\frac{\mathbf{R}_{\mathrm{F}}}{\mathbf{W} \cdot \frac{\mathbf{x} + \mu \cdot \mathbf{h}}{\mathbf{b}}}\right) \end{aligned}$$

$$\mathbf{ex} \ 5.000027^{\circ} = a \cos\left(\frac{4625.314\mathrm{N}}{11000\mathrm{N} \cdot \frac{1.15\mathrm{m} + 0.49 \cdot 0.065\mathrm{m}}{2.8\mathrm{m}}}\right) \end{aligned}$$





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6) Vehicle Weight with All Wheel Brake on Front Wheel 🕑

$$f_{\mathbf{X}} W = \frac{R_{F}}{(\mathbf{x} + \mathbf{\mu} \cdot \mathbf{h}) \cdot \frac{\cos(\theta)}{\mathbf{b}}}$$

$$e_{\mathbf{X}} 11000N = \frac{4625.314N}{(1.15m + 0.49 \cdot 0.065m) \cdot \frac{\cos(5^{\circ})}{2.8m}}$$

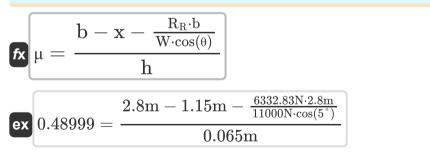
7) Wheel Base with All Wheel Braking on Front Wheel

fx 
$$\mathbf{b} = \mathbf{W} \cdot (\mathbf{x} + \mathbf{\mu} \cdot \mathbf{h}) \cdot rac{\cos(\theta)}{\mathbf{R}_{\mathrm{F}}}$$

$$ext{ex} 2.8 ext{m} = 11000 ext{N} \cdot (1.15 ext{m} + 0.49 \cdot 0.065 ext{m}) \cdot rac{ ext{cos}(5\degree)}{4625.314 ext{N}}$$

### Effects on Rear Wheel 🕑

# 8) Friction Coefficient between Wheel and Road Surface with Rear Wheel Brake



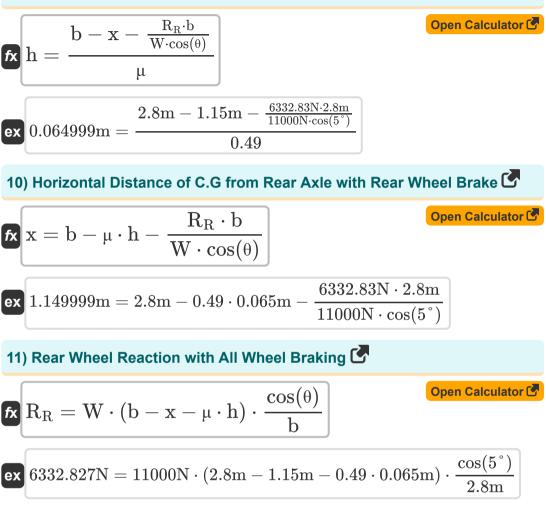
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9) Height of C.G. from Road Surface with Rear Wheel Brake 🗹





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12) Slope of Road from Braking with Rear Wheel Reaction 🕑

$$f_{\mathbf{X}} = a \cos\left(\frac{R_{R}}{W \cdot \frac{b-x-\mu \cdot h}{b}}\right)$$

$$e_{\mathbf{X}} 4.99974^{\circ} = a \cos\left(\frac{6332.83N}{11000N \cdot \frac{2.8m-1.15m-0.49\cdot0.065m}{2.8m}}\right)$$

$$f_{\mathbf{X}} 4.99974^{\circ} = a \cos\left(\frac{6332.83N}{11000N \cdot \frac{2.8m-1.15m-0.49\cdot0.065m}{2.8m}}\right)$$

$$f_{\mathbf{X}} W = \frac{R_{R}}{(b-x-\mu \cdot h) \cdot \frac{\cos(\theta)}{b}}$$

$$e_{\mathbf{X}} 11000N = \frac{6332.83N}{(2.8m-1.15m-0.49\cdot0.065m) \cdot \frac{\cos(5^{\circ})}{2.8m}}$$

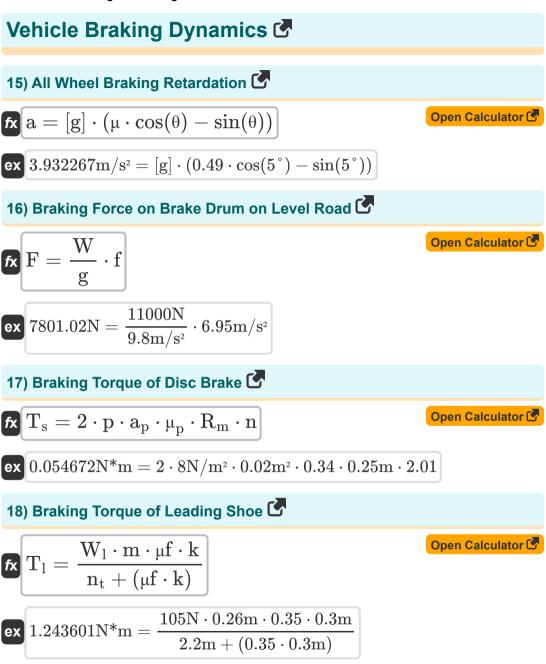
$$f_{\mathbf{X}} W = \frac{W \cdot \cos(\theta) \cdot (x + \mu \cdot h)}{W \cdot \cos(\theta) - R_{R}}$$

$$f_{\mathbf{X}} b = \frac{W \cdot \cos(\theta) \cdot (x + \mu \cdot h)}{W \cdot \cos(\theta) - R_{R}}$$

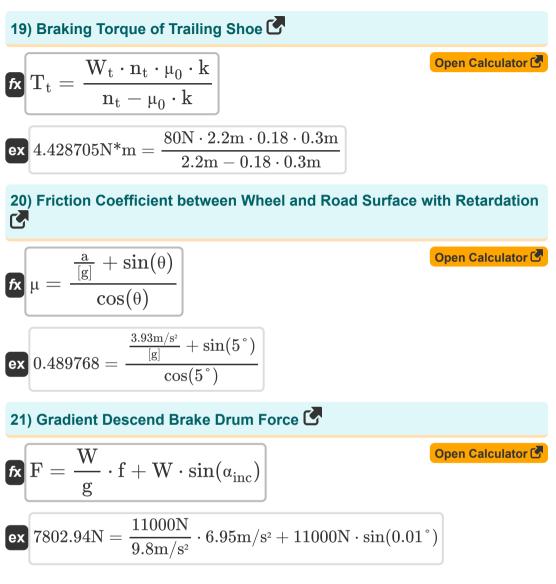
$$e_{\mathbf{X}} 2.80002m = \frac{11000N \cdot \cos(5^{\circ}) \cdot (1.15m + 0.49 \cdot 0.065m)}{11000N \cdot \cos(5^{\circ}) - 6332.83N}$$





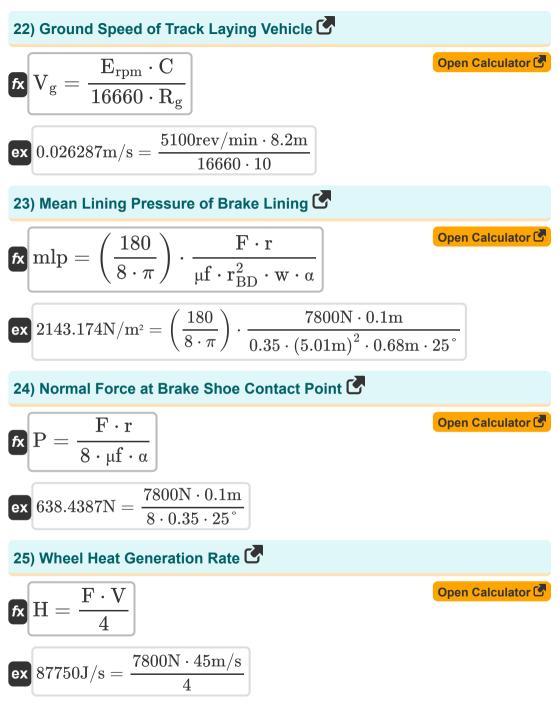
















# Variables Used

- **a** Retardation Produced by Braking (Meter per Square Second)
- **a**p Area of One Piston per Caliper (Square Meter)
- **b** Vehicle Wheelbase (Meter)
- C Driving Sprocket Circumference (Meter)
- Erpm Engine RPM (Revolution per Minute)
- **f** Vehicle Deceleration (Meter per Square Second)
- **F** Brake Drum Braking Force (Newton)
- g Acceleration due to Gravity (Meter per Square Second)
- h Height of Center of Gravity (C.G.) of Vehicle (Meter)
- H Heat Generated per Second at Each Wheel (Joule per Second)
- **k** Effective Radius of Normal Force (Meter)
- **m** Distance of Actuating Force from Horizontal (Meter)
- mlp Mean Lining Pressure (Newton per Square Meter)
- **n** Number of Caliper Units
- **n**<sub>t</sub> Force of Trailing Shoe Distance from Horizontal (Meter)
- **p** Line Pressure (Newton per Square Meter)
- P Normal Force between Shoe and Drum (Newton)
- r Effective Wheel Radius (Meter)
- **r**<sub>BD</sub> Brake Drum Radius (Meter)
- **R**<sub>F</sub> Normal Reaction at the Front Wheel (Newton)
- R<sub>g</sub> Overall Gear Reduction
- R<sub>m</sub> Mean Radius of Caliper Unit to Disc Axis (Meter)
- **R**<sub>R</sub> Normal Reaction at Rear Wheel (*Newton*)

- T<sub>I</sub> Leading Shoe Braking Torque (Newton Meter)
- **T**<sub>s</sub> Disc Brake Braking Torque (Newton Meter)
- T<sub>t</sub> Trailing Shoe Braking Torque (Newton Meter)
- V Vehicle Speed (Meter per Second)
- V<sub>q</sub> Ground Speed of Track Laying Vehicle (Meter per Second)
- W Brake Lining Width (Meter)
- W Vehicle Weight (Newton)
- WI Leading Shoe Actuating Force (Newton)
- Wt Trailing Shoe Actuating Force (Newton)
- X Horizontal Distance of C.G. from Rear Axle (Meter)
- α Angle between Linings of Brake Shoes (Degree)
- α<sub>inc</sub> Angle of Inclination of Plane to Horizontal (Degree)
- **θ** Inclination Angle of Road (*Degree*)
- µ Friction Coefficient Between Wheels and Ground
- $\mu_0$  Friction Coefficient for Smooth Road
- µ<sub>p</sub> Friction Coefficient of Pad Material
- µf Friction Coefficient between Drum and Shoe





## **Constants, Functions, Measurements used**

- Constant: pi, 3.14159265358979323846264338327950288 Archimedes' constant
- Constant: [g], 9.80665 Gravitational acceleration on Earth
- Function: acos, acos(Number) The inverse cosine function, is the inverse function of the cosine function. It is the function that takes a ratio as an input and returns the angle whose cosine is equal to that ratio.
- Function: **cos**, cos(Angle) Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.
- 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: Area in Square Meter (m<sup>2</sup>) Area Unit Conversion
- Measurement: Pressure in Newton per Square Meter (N/m<sup>2</sup>) Pressure Unit Conversion
- Measurement: Speed in Meter per Second (m/s)
   Speed Unit Conversion
- Measurement: Acceleration in Meter per Square Second (m/s<sup>2</sup>) Acceleration Unit Conversion
- Measurement: Power in Joule per Second (J/s) Power Unit Conversion



- Measurement: Force in Newton (N) Force Unit Conversion
- Measurement: Angle in Degree (°) Angle Unit Conversion
- Measurement: Angular Velocity in Revolution per Minute (rev/min) Angular Velocity Unit Conversion
- Measurement: Torque in Newton Meter (N\*m) Torque Unit Conversion



## Check other formula lists

- All Wheel Braking for Racing Car
   Rear Wheel Braking for Racing Formulas
   Car Formulas
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