Important Force Formulas PDF

Formulas
Examples
with Units

List of 15
Important Force Formulas

1) Brake Clamp Load Formula

Evaluate Formula

Formula

$$C = \frac{T}{r_e \cdot \mu_f \cdot n}$$

Example with Units

$$0.202\,\text{N} = \frac{25\,\text{N*m}}{9\,\text{m} \cdot 2.5 \cdot 5.5}$$

2) Braking Force on Drum for Simple Band Brake Formula

Evaluate Formula

Formula

$$F_{braking} = T_1 - T_2$$

Example with Units

$$4\,\text{N} = 720\,\text{N} - 716\,\text{N}$$

3) Force on Lever of Simple Band Brake for Anticlockwise Rotation of Drum Formula

Evaluate Formula

Formula

$$P = \frac{T_2 \cdot b}{l}$$

Example with Units

$$32.5455\,\text{N} = \frac{716\,\text{N} \cdot .05\,\text{m}}{1.1\,\text{m}}$$

4) Force on Lever of Simple Band Brake for Clockwise Rotation of Drum Formula

Evaluate Formula

Formula

$$P = \frac{T_1 \cdot b}{l}$$

Example with Units

$$32.7273\,\text{N} = \frac{720\,\text{N} \cdot .05\,\text{m}}{1.1\,\text{m}}$$

5) Maximum Braking Force Acting at Front Wheels when Brakes are Applied to Front Wheels only Formula

Evaluate Formula

Formula

$$F_{braking} = \mu_{brake} \cdot R_A$$

Example with Units

$$4\,\text{N} = 0.35 \cdot 11.4286\,\text{N}$$

6) Maximum Value of Total Braking Force Acting at Rear Wheels when Brakes Applied to Rear Wheels only Formula

Evaluate Formula

Formula

$$F_{braking} = \mu_{brake} \cdot R_B$$

Example with Units

$$4.025\,\text{N} = 0.35 \cdot 11.5\,\text{N}$$

7) Normal Force for Shoe Brake if Line of Action of Tangential Force Passes above Fulcrum (Anti Clock) Formula

Evaluate Formula

Formula

$$Fn = \frac{P \cdot l}{x + \mu_{brake} \cdot a_{shift}}$$

Example with Units

$$10.9147\,N = \frac{32\,N \cdot 1.1\,m}{2\,m + 0.35 \cdot 3.5\,m}$$

8) Normal Force for Shoe Brake if Line of Action of Tangential Force Passes above Fulcrum (Clockwise) Formula

Evaluate Formula

Formula

$$Fn = \frac{P \cdot l}{x - \mu_{brake} \cdot a_{shift}}$$

Example with Units

$$45.4194\,N = \frac{32\,N \cdot 1.1\,m}{2\,m - 0.35 \cdot 3.5\,m}$$

9) Normal Force for Shoe Brake if Line of Action of Tangential Force Passes below Fulcrum (Anti Clock) Formula

Evaluate Formula

Formula

$$Fn = \frac{P \cdot l}{x - \mu_{brake} \cdot a_{shift}}$$

Example with Units

$$45.4194\,N = \frac{32\,N \cdot 1.1\,m}{2\,m - 0.35 \cdot 3.5\,m}$$

10) Normal Force for Shoe Brake if Line of Action of Tangential Force Passes below Fulcrum (Clockwise) Formula

Evaluate Formula

Formula

$$Fn = \frac{P \cdot l}{x + \mu_{brake} \cdot a_{shift}}$$

Example with Units

$$10.9147\,N = \frac{32\,N \cdot 1.1\,m}{2\,m + 0.35 \cdot 3.5\,m}$$

11) Normal Force Pressing Brake Block on Wheel for Shoe Brake Formula

Evaluate Formula

Formula

$$Fn = \frac{P \cdot l}{x}$$

Example with Units

$$17.6\,N = \frac{32\,N \cdot 1.1\,m}{2\,m}$$

12) Tangential Braking Force Acting at Contact Surface of Block and Wheel for Shoe Brake Formula

Evaluate Formula

Formula

$$F_t = \mu_{brake} \cdot R_N$$

Example with Units

$$2.1\,N = 0.35 \cdot 6\,N$$

13) Tangential Braking Force given Normal Force on Brake Block Formula

Evaluate Formula

Formula

$$F_t = \mu_{brake} \cdot R_N \cdot r_{wheel}$$

Example with Units

$$2.121\,N = 0.35 \cdot 6\,N \cdot 1.01\,m$$

14) Total Braking Force Acting at Front Wheels (when Brakes are Applied to Front Wheels only) Formula

Evaluate Formula

Formula

$$F_{braking} = m \cdot a - m \cdot g \cdot \sin\left(\alpha_{inclination}\right)$$

Example with Units

$$4.0053\,\text{N} = 54.73\,\text{kg} \cdot 8.955\,\text{m/s}^2 - 54.73\,\text{kg} \cdot 9.8\,\text{m/s}^2 \cdot \sin\left(65^\circ\right)$$

15) Total Braking Force Acting at Rear Wheels when Brakes are Applied to Rear Wheels only Formula

Evaluate Formula

Formula

$$F_{braking} = m \cdot a - m \cdot g \cdot \sin\left(\alpha_{inclination}\right)$$

Example with Units

$$4.0053\,\text{N} = 54.73\,\text{kg} \cdot 8.955\,\text{m/s}^2 - 54.73\,\text{kg} \cdot 9.8\,\text{m/s}^2 \cdot \sin\left(65^\circ\right)$$

Variables used in list of Force Formulas above

- **a** Retardation of Vehicle *(Meter per Square Second)*
- a_{shift} Shift in Line of Action of Tangential Force *(Meter)*
- **b** Perpendicular Distance from Fulcrum *(Meter)*
- **C** Brake Clamp Load *(Newton)*
- $F_{braking}$ Braking Force *(Newton)*
- F_t Tangential Braking Force Acting Contact Surface *(Newton)*
- **Fn** Normal Force *(Newton)*
- **g** Acceleration due to Gravity *(Meter per Square Second)*
- **l** Distance b/w Fulcrum and End of Lever *(Meter)*
- **m** Mass of Vehicle *(Kilogram)*
- **n** Number of Friction Faces
- **P** Force Applied at the End of the Lever *(Newton)*
- R_A Normal Reaction between Ground and Front Wheel *(Newton)*
- R_B Normal Reaction between Ground and Rear Wheel *(Newton)*
- r_e Effective Radius *(Meter)*
- R_N Normal Force Pressing the Brake Block on the Wheel *(Newton)*
- r_{wheel} Radius of Wheel *(Meter)*
- **T** Brake Torque *(Newton Meter)*
- T_1 Tension in Tight Side of the Band *(Newton)*
- T_2 Tension in the Slack Side of Band *(Newton)*
- **x** Distance b/w Fulcrum and Axis of Wheel *(Meter)*
- $\alpha_{inclination}$ Angle of Inclination of Plane to Horizontal *(Degree)*
- μ_{brake} Coefficient of Friction for Brake
- μ_f Disc Coefficient of Friction

Constants, Functions, Measurements used in list of Force Formulas above

- Functions: **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: **Acceleration** in Meter per Square Second (m/s²)
  Acceleration Unit Conversion
- Measurement: **Force** in Newton (N)
  Force Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Torque** in Newton Meter (N*m)
  Torque Unit Conversion

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