# Load distribution ~~of weight on~~ for Three wheeled Vehicle

The forces acting on vehicle at rest

where,

W = Weight of the Vehicle

b = Wheel base.

l = distance of CG from the rear axle

h = height of CG from the road Suface.

c = distance of CG from central axis

a = Wheel track

$R_F$ = Vertical reaction at Front wheel

$R_{R_1}$, $R_{R_2}$ = Vertical reaction at the Rear wheel

There are three unknowns which can be determined as follows.

Moment about rear axle gives

$$R_f b = W l$$

$$\boxed{R_f = \frac{Wl}{b}}$$

Moment about Central axis gives

$$(R_{R_2} - R_{R_1}) \frac{a}{2} = W_C$$

$$\boxed{R_{R_2} - R_{R_1} = \frac{2W_C}{a}} \longrightarrow (1)$$

Moment about central axis of the front wheel gives

$$(R_{R_1} + R_{R_2})\, b = W(b - l)$$

$$R_{R_1} + R_{R_2} = W\left[\frac{b - l}{b}\right]$$

$$\boxed{R_{R_1} + R_{R_2} = W\left[1 - \frac{l}{b}\right]} \longrightarrow (2)$$

Equating (1) & (2).

$$2R_{R_2} = W\left[1 - \frac{l}{b}\right] + \frac{2W_C}{a}$$

$$2R_{R_2} = W - \left(\frac{l}{b} \times W\right) + \frac{2W_C}{a}$$

$$R_{R_2} = \frac{W}{2} - \frac{l \times W}{b \times 2} + \frac{2W_C}{2a}$$

$$R_{R_2} = \frac{W}{2}\left[1 - \frac{l}{b} + \frac{2c}{a}\right]$$

~~Eq~~ (2)..

Sub $R_{R_2}$ in (1).

$$\frac{W}{2}\left[1 - \frac{l}{b} + \frac{2c}{a}\right] - R_{R_1} = \frac{2Wc}{a}$$

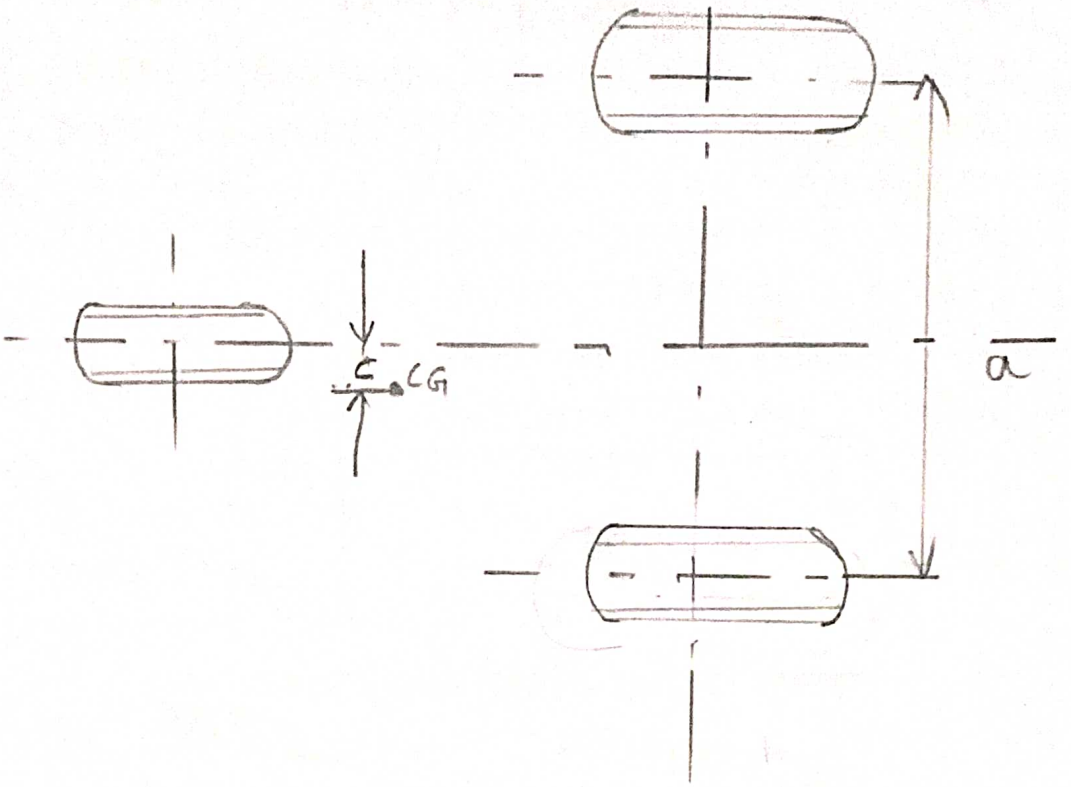
$$\frac{W}{2}\left[1 - \frac{l}{b} + \frac{2c}{a}\right] - \frac{2Wc}{a} = R_{R_1}$$

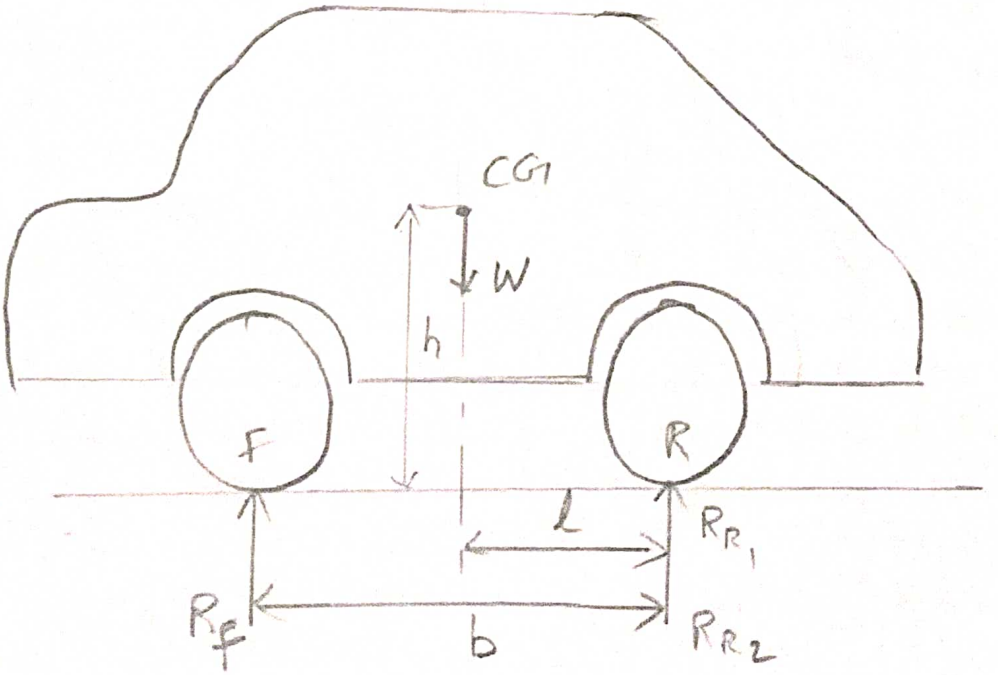
$$R_{R_1} = \frac{W}{2} - \frac{Wl}{2b} + \frac{W2c}{2a} - \frac{2Wc}{a}$$

$$= \frac{W}{2}\left[1 - \frac{l}{b} + \frac{2c}{a} - \frac{4c}{a}\right]$$

$$R_{R_1} = \frac{W}{2}\left[1 - \frac{l}{b} - \frac{2c}{a}\right]$$

Also, $W = R_F + R_{R_1} + R_{R_2}$ must be satisfied and serves as an extra equation for alternative Solution


c
CG
a


CG
W
h
F
R
l
$R_{R_1}$
$R_f$
b
$R_{R_2}$