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Suspension Geometry Formulas

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List of 24 Suspension Geometry Formulas

Suspension Geometry

1) Centre of Gravity Position Distance from Front Wheels

Open Calculator

fx $$a = \frac{W_r \cdot b}{m}$$

ex $$2465.217\text{mm} = \frac{210\text{kg} \cdot 1350\text{mm}}{115\text{kg}}$$

2) Centre of Gravity Position Distance from Rear Wheels

Open Calculator

fx $$c = \frac{W_f \cdot b}{m}$$

ex $$1526.087\text{mm} = \frac{130\text{kg} \cdot 1350\text{mm}}{115\text{kg}}$$

3) Force Applied by Coil Spring

Open Calculator

fx $$F_{coil} = k \cdot x$$

ex $$15\text{N} = 100\text{N/m} \cdot 150\text{mm}$$

4) Installation Ratio given Motion Ratio

Open Calculator

fx $$IR = \sqrt{M.R.}$$

ex $$0.921954 = \sqrt{0.85}$$

5) Mass on front axle given position of COG

Open Calculator

fx $$W_f = \frac{c}{\frac{b}{m}}$$

ex $$188.2593\text{kg} = \frac{2210\text{mm}}{\frac{1350\text{mm}}{115\text{kg}}}$$

6) Motion Ratio given Installation Ratio

Open Calculator

fx $$M.R. = IR^2$$

ex $$0.36 = (0.6)^2$$

7) Wheel Base of Vehicle given COG Position from Rear Axle

Open Calculator

fx $$b = \frac{c}{\frac{W_f}{m}}$$

ex $$1955\text{mm} = \frac{2210\text{mm}}{\frac{130\text{kg}}{115\text{kg}}}$$

Anti Geometry of Independent Suspension

8) Angle between IC and Ground

Open Calculator

fx $$\Phi R = a\tan\left(\frac{SVSA_h}{SVSA_l}\right)$$

ex $$18.43495^\circ = a\tan\left(\frac{200mm}{600mm}\right)$$

9) Camber Change Rate

Open Calculator

fx $$\theta = a\tan\left(\frac{1}{fvsa}\right)$$

ex $$36.89742^\circ = a\tan\left(\frac{1}{1332mm}\right)$$

10) Front View Swing Arm

Open Calculator

fx $$fvsa = \frac{\frac{a_{tw}}{2}}{1 - RC}$$

ex $$1332.667mm = \frac{\frac{1999mm}{2}}{1 - 0.25}$$

11) Height of Centre of Gravity from Road Surface from Percentage Anti Dive

Open Calculator

$$h = \frac{(\%B_f) \cdot \left(\frac{SVSA_h}{SVSA_l}\right) \cdot b}{\%AD_f}$$

$$10000\text{mm} = \frac{(60) \cdot \left(\frac{200\text{mm}}{600\text{mm}}\right) \cdot 1350\text{mm}}{2.7}$$

12) Height of Centre of Gravity from Road Surface from Percentage Anti Lift

Open Calculator

$$h = \frac{(\%B_r) \cdot \left(\frac{SVSA_h}{SVSA_l}\right) \cdot b}{\%AL_r}$$

$$9870.438\text{mm} = \frac{(60.1) \cdot \left(\frac{200\text{mm}}{600\text{mm}}\right) \cdot 1350\text{mm}}{2.74}$$

13) Percent Anti Squat

Open Calculator

$$\%AS = \left(\frac{\tan(\Phi R)}{\frac{h}{b}}\right) \cdot 100$$

$$4.498704 = \left(\frac{\tan(18.43^\circ)}{\frac{10000\text{mm}}{1350\text{mm}}}\right) \cdot 100$$

14) Percentage Anti Dive on Front

Open Calculator

fx $$\%AD_f = (\%B_f) \cdot \frac{\frac{SVSA_h}{SVSA_l}}{\frac{h}{b}}$$

ex $$2.7 = (60) \cdot \frac{\frac{200mm}{600mm}}{\frac{10000mm}{1350mm}}$$

15) Percentage Anti Lift

Open Calculator

fx $$\%AL_r = (\%B_f) \cdot \frac{\frac{SVSA_h}{SVSA_l}}{\frac{h}{b}}$$

ex $$2.7 = (60) \cdot \frac{\frac{200mm}{600mm}}{\frac{10000mm}{1350mm}}$$

16) Percentage Front Braking given Percentage Anti Dive

Open Calculator

fx $$\%B_f = \frac{\%AD_f}{\frac{\frac{SVSA_h}{SVSA_l}}{\frac{h}{b}}}$$

ex $$60 = \frac{2.7}{\frac{\frac{200mm}{600mm}}{\frac{10000mm}{1350mm}}}$$

17) Percentage Rear Braking given Percentage Anti Lift

Open Calculator

$$\%B_r = \frac{\%AL_r}{\frac{\frac{SVSA_h}{SVSA_l}}{\frac{h}{b}}}$$

$$60.88889 = \frac{2.74}{\frac{\frac{200mm}{600mm}}{\frac{10000mm}{1350mm}}}$$

18) Roll Camber

Open Calculator

$$RC = \frac{\theta c}{RA}$$

$$0.25 = \frac{2^\circ}{8^\circ}$$

19) Wheelbase of Vehicle from Percentage Anti Dive

Open Calculator

$$b = \frac{\%AD_f}{(\%B_f) \cdot \frac{\frac{SVSA_h}{SVSA_l}}{h}}$$

$$1350mm = \frac{2.7}{(60) \cdot \frac{\frac{200mm}{600mm}}{10000mm}}$$

20) Wheelbase of Vehicle from Percentage Anti Lift

Open Calculator

fx $$b = \frac{\%AL_r}{(\%B_f) \cdot \frac{\frac{SVSA_h}{SVSA_l}}{h}}$$

ex $$1370mm = \frac{2.74}{(60) \cdot \frac{\frac{200mm}{600mm}}{10000mm}}$$

Side View

21) Side View Swing Arm Height given Percentage Anti Dive

Open Calculator

fx $$SVSA_h = \frac{\%AD_f}{(\%B_f) \cdot \frac{\frac{1}{SVSA_l}}{\frac{h}{b}}}$$

ex $$200mm = \frac{2.7}{(60) \cdot \frac{\frac{1}{600mm}}{\frac{10000mm}{1350mm}}}$$

22) Side View Swing Arm Height given Percentage Anti Lift

Open Calculator

fx $$SVSA_h = \frac{\%AL_r}{(\%B_r) \cdot \frac{\frac{1}{SVSA_l}}{\frac{h}{b}}}$$

ex $$202.6253mm = \frac{2.74}{(60.1) \cdot \frac{\frac{1}{600mm}}{\frac{10000mm}{1350mm}}}$$

23) Side View Swing Arm Length given Percentage Anti Dive

Open Calculator

fx $$\mathrm{SVSA_l} = \frac{(\%\mathrm{B_f}) \cdot \frac{\mathrm{SVSA_h}}{\frac{\mathrm{h}}{\mathrm{b}}}}{\%\mathrm{AD_f}}$$

ex $$600\mathrm{mm} = \frac{(60) \cdot \frac{200\mathrm{mm}}{\frac{10000\mathrm{mm}}{1350\mathrm{mm}}}}{2.7}$$

24) Side View Swing Arm Length given Percentage Anti Lift

Open Calculator

fx $$\mathrm{SVSA_l} = \frac{(\%\mathrm{B_r}) \cdot \frac{\mathrm{SVSA_h}}{\frac{\mathrm{h}}{\mathrm{b}}}}{\%\mathrm{AL_r}}$$

ex $$592.2263\mathrm{mm} = \frac{(60.1) \cdot \frac{200\mathrm{mm}}{\frac{10000\mathrm{mm}}{1350\mathrm{mm}}}}{2.74}$$

Variables Used

- **$\%AD_f$** Percentage Anti Dive Front
- **$\%AL_r$** Percentage Anti Lift
- **%AS** %Anti Squat
- **$\%B_f$** Percentage Front Braking
- **$\%B_r$** Percentage Rear Braking
- **a** Horizontal Distance of C.G. from Front Axle *(Millimeter)*
- **a_{tw}** Track Width of Vehicle *(Millimeter)*
- **b** Wheelbase of Vehicle *(Millimeter)*
- **c** Horizontal Distance of C.G. from Rear Axle *(Millimeter)*
- **F_{coil}** Force Coil spring *(Newton)*
- **fvsa** Front View Swing Arm *(Millimeter)*
- **h** Height of CG above Road *(Millimeter)*
- **IR** Installation Ratio
- **k** Coil Spring Stiffness *(Newton per Meter)*
- **m** Mass of Vehicle *(Kilogram)*
- **M.R.** Motion Ratio in Suspension
- **RA** Roll Angle *(Degree)*
- **RC** Roll Camber
- **$SVSA_h$** Side View Swing Arm Height *(Millimeter)*
- **$SVSA_l$** Side View Swing Arm Length *(Millimeter)*
- **W_f** Mass on Front Axle *(Kilogram)*
- **W_r** Mass on Rear Axle *(Kilogram)*

- **x** Maximum Compression in Spring *(Millimeter)*
- **θ** Camber Change Rate *(Degree)*
- **θc** Camber Angle *(Degree)*
- **ΦR** Angle between IC and Ground *(Degree)*

Constants, Functions, Measurements used

- Function: **atan**, atan(Number)
  Inverse trigonometric tangent function
- Function: **sqrt**, sqrt(Number)
  Square root function
- Function: **tan**, tan(Angle)
  Trigonometric tangent function
- Measurement: **Length** in Millimeter (mm)
  Length Unit Conversion
- Measurement: **Weight** in Kilogram (kg)
  Weight 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

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