

Formulas used on the Car Math

Here are the formulas for most of the Car Math Calculators .

* Many of the formulas use the value of pi which is 3.1415927

* Some formulas contain notation such as ^2 which means "squared" or ^3 which means "cubed"

Formulas for Calculating Carburetors CFM

Engine size (cid) x maximum RPM / 3456 = CMF
CMF @ 100% Volumetric efficiency

(example: 250 CID x 6000RPM = 2,100,000 / 3456 = 608 CMF)

Formulas for Calculating Performance

Convert between 1/4 mile and 1/8 mile ET's

1/4 mile ET = 1/8 mile ET x 1.5832 (thanks to Bobby Mosher for this formula)

1/8 mile ET = 1/4 mile ET / 1.5832 (thanks to Bobby Mosher for this formula)

Calculate 1/4 mile ET and MPH from HP and Weight

ET = ((Weight / HP)^{.333}) * 5.825

MPH = ((HP / Weight)^{.333}) * 234

Calculate HP From ET and Weight

HP = (Weight / ((ET/5.825)³))

Calculate HP From MPH and Weight

HP = (((MPH / 234)³) * Weight)

Formulas for displacement, bore and stroke

pi/4 = 0.7853982

cylinder volume = $\pi/4 \times \text{bore}^2 \times \text{stroke}$

stroke = displacement / ($\pi/4 \times \text{bore}^2 \times \text{number of cylinders}$)

Formulas for compression ratio

$(\text{CylVolume} + \text{ChamberVolume}) / \text{ChamberVolume}$

cylinder volume = $\pi/4 \times \text{bore}^2 \times \text{stroke}$

chamber volume = cylinder volume / compression ratio - 1.0

displacement ratio = cylinder volume / chamber volume

amount to mill = $(\text{new disp. ratio} - \text{old disp. ratio} / \text{new disp. ratio} \times \text{old disp. ratio}) \times \text{stroke}$

Formulas for piston speed

piston speed in fpm = stroke in inches x rpm / 6

rpm = piston speed in fpm x 6 / stroke in inches

Formulas for brake horsepower

horsepower = rpm x torque / 5252

torque = 5252 x horsepower / rpm

brake specific fuel consumption = fuel pounds per hour / brake horsepower

bhp loss = elevation in feet / 1000 x 0.03 x bhp at sea level

Formulas for indicated horsepower & torque

horsepower = mep x displacement x rpm / 792,00

torque = mep x displacement / 150.8

mep = hp x 792,000 / displacement x rpm

mep = hp x 792,000 / displacement x rpm

mechanical efficiency = brake output / indicated output x 100

friction output = indicated output - brake output

taxable horsepower = bore² x cylinders / 2.5

Formulas for air capacity & volumetric efficiency

theoretical cfm = rpm x displacement / 3456

volumetric efficiency = actual cfm / theoretical cfm x 100

street carb cfm = rpm x displacement / 3456 x 0.85

racin carb cfm = rpm x displacement / 3456 x 1.1

Formulas for tire size & their effect

effective ratio = (old tire diameter / new tire diameter) x original ratio

actual mph = (new tire diameter / old tire diameter) x actual mph

Formulas for g force & weight transfer

drive wheel torque = flywheel torque x first gear x final drive x 0.85

wheel thrust = drive wheel torque / rolling radius

g = wheel thrust / weight

weight transfer = weight x cg height / wheelbase x g

lateral acceleration = 1.227 x radius / time²

lateral weight transfer = weight x cg height / wheel track x g

centrifugal force = weight x g

Formulas for shift points

rpm after shift = ratio shift into / ratio shift from x rpm before shift

driveshaft torque = flywheel torque x transmission ratio

Formula for instrument error

actual mph = 3600 / seconds per mile

speedo error percent = difference between actual and indicated speed / actual speed x 100

indicated distance = odometer reading at finish - odometer reading at start

odo error percent = difference between actual and indicated distances / actual distance x 100

Formulas for MPH RPM gears & tires

mph = (rpm x tire diameter) / (gear ratio x 336)

rpm = (mph x gear ratio x 336) / tire diameter

gear ratio = (rpm x tire diameter) / (mph x 336)

tire diameter = (mph x gear ratio x 336) / rpm

Formulas for weight distribution

percent of weight on wheels = weight on wheels / overweight x 100

increased weight on wheels = [distance of cg from wheels / wheelbase x weight] + weight

Formulas for center of gravity

cg location behind front wheels = rear wheel weights / overall weight x wheelbase

cg location off-center to heavy side = track / 2 - [weight on light side / overall weight] x track

cg height = [level wheelbase x raised wheelbase x added weight on scale / distance raised] x overall weight