## 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 $=2,100,000 / 3456=608 \mathrm{CMF}$ )

## Formulas for Calculating Performance

Convert between $1 / 4$ mile and $1 / 8$ mile ET's
$1 / 4$ mile ET $=1 / 8$ mile ET $\times 1.5832$ (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

$$
\begin{aligned}
& \mathrm{ET}=\left((\text { Weight } / \mathrm{HP})^{\wedge} .333\right) * 5.825 \\
& \text { MPH }=\left((\mathrm{HP} / \text { Weight })^{\wedge} .333\right) * 234
\end{aligned}
$$

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

$\mathrm{pi} / 4=0.7853982$
cylinder volume $=$ pi/4 $\times$ bore $^{\wedge} 2 \times$ stroke
stroke $=$ displacement $/\left(\right.$ pi/4 $\times$ bore ${ }^{\wedge} 2 \times$ number of cylinders $)$

## Formulas for compression ratio

(CyIVolume + ChamberVolume) / ChamberVolume
cylinder volume $=$ pi/4 x bore ${ }^{\wedge} 2 \times$ stroke
chamber volume $=$ cylinder volume $/$ compression ratio-1.0
displacement ratio = cylinder volume / chamber volume
amount to mill $=$ (new disp. ratio - old disp. ratio / new disp. ratio x old disp. ratio) x stroke

## Formulas for piston speed

piston speed in fpm = stroke in inches x rpm / 6
rpm $=$ piston speed in fpm $\times 6 /$ stroke in inches

## Formulas for brake horsepower

horsepower $=$ rpm $\times$ torque $/ 5252$
torque $=5252 \times$ horsepower $/ \mathrm{rpm}$
brake specific fuel consumption = fuel pounds per hour / brake horsepower bhp loss $=$ elevation in feet $/ 1000 \times 0.03 \times$ bhp at sea level

## Formulas for indicated horsepower \& torque

horsepower $=$ mep $\times$ displcement $\times$ rpm / 792,00
torque $=$ mep x displacement $/ 150.8$
mep $=h p \times 792,000 /$ displacement $\times r p m$
mep $=h p \times 792,000 /$ displacement $\times r p m$
mechanical efficiency $=$ brake output $/$ indocated output $\times 100$
friction output $=$ indicated output - brake output
taxable horsepower $=$ bore $2 \times$ cylinders $/ 2.5$

## Formulas for air capacity \& volumetric efficiency

theoretical cfm $=$ rpm $\times$ displacement $/ 3456$
volumetric efficiency $=$ acutal $\mathrm{cfm} /$ theoretical $\mathrm{cfm} \times 100$
street carb cfm $=r p m \times$ displacement $/ 3456 \times 0.85$
racin carb cfm $=\mathrm{rpm} \times$ displacement $/ 3456 \times 1.1$

## Formulas for tire size \& their effect

effective ratio $=($ old tire diameter $/$ new tire diameter $) \times$ original ratio actual $\mathrm{mph}=($ new tire diameter / old tire diameter) x actual mph

## Formulas for $\mathbf{g}$ force \& weight transfer

drive wheel torque $=$ flywheel torque x first gear x final drive $\times 0.85$
wheel thrust = drive wheel torque / rolling radius
$\mathrm{g}=$ wheel thrust / weight
weight transfer $=$ weight x cg height $/$ wheelbase $\times \mathrm{g}$
lateral acceleration $=1.227 \times$ raduis $/$ time ${ }^{\wedge} 2$
lateral weight transfer $=$ weight x cg height $/$ wheel track xg
centrufugal force $=$ weight xg

## Formulas for shift points

rpm after shift $=$ ratio shift into $/$ ratio shift from $\times$ rpm before shift drivehsaft torque $=$ flywheel torque x transmission ratio

## Formula for instrument error

actual $\mathrm{mph}=3600 /$ 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

$m p h=(r p m \times$ tire diameter $) /($ gear ratio $\times 336)$
$r p m=(m p h \times$ gear ratio $\times 336) /$ tire daimeter
gear ratio $=(r p m \times$ tire diameter $) /(m p h \times 336)$
tire diameter $=(m p h \times$ gear ratio $\times 336) / \mathrm{rpm}$

## Formulas for weight distribution

percent of weight on wheels $=$ weight on wheels / overweight $\times 100$
increased weight on wheels $=[$ distance of cg from wheels $/$ wheelbase $x$ weight $]+$ weight

## Formulas for center of gravity

cj 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 $\times$ raised wheelbase $\times$ added weight on scale / distance raised ] x overall weight

