

Competition Driving Techniques

Topics:

- Smooth Driving
- Traction And Grip
- Weight Transfers
- Steering
- Braking
- Understeer
- Oversteer
- The Racing Line

Smooth Driving

In every racing discipline, aggression doesn't equal speed.

If you must learn only one skill to improve your driving technique, it would be the art of smooth driving. Driving smoothly will limit weight transfers, make the most of every bit of grip and maintain control at higher speeds.

If you're driving at 50% of your car's potential, you'll get away with rough gear changes and aggressive braking, accelerating and steering. On the other hand, when you're driving near your car's limits, being aggressive could lead to loss of traction, poor track times and increased risk of crashing.

Smooth driving can be divided into those topics:

- Steering
- Braking
- Acceleration
- Weight transfers
- Combining Acceleration, Braking, And Steering

Steering

When using a wheel, place your hands at the 09:45 position to allow fairly tight radius corners to be tackled without having to take your hands off the wheel.

Tips:

Avoid "chucking" the car into a corner. Ease it, allowing the weight to shift to the outside of the car in a progressive manner. Spikes in force need to be avoided when driving near the limit.

Do not place additional demands on the tyre's grip early in the corner (i.e. by braking), as this is when loss of control is most likely.

Unwinding the steering in an aggressive manner is just as likely to upset the balance of the car. Steering motions should be smooth.

Braking

You can brake much faster than you can accelerate so the forces involved have greater potential to unsettle the balance of your car and cause loss of grip. Squeeze the brake pedal smoothly. Never jump on the brakes and try not to get into the habit of allowing ABS to sort out locked wheels.*

*: Formula 1 cars don't have ABS brakes anymore, but you can enable it in the driving assists of F1 2010.

This doesn't mean that you can't brake hard, but be sure that the pressing and releasing motions are progressive. This will minimize weight transfer spikes and reduce the chances of unnecessary weight transfers or wheel-lock.

Acceleration

Progressive accelerator inputs are important in powerful F1 cars as there is a greater likelihood of wheel-spin. Never stamp on the gas when accelerating or after a gear change. This can lead to spinning wheels and/or loss of control.

Remember that engine braking can just as important as acceleration, so think about weight transfers when lifting off. Lift-off oversteer can occur if you totally come off the gas mid way through a corner.

Weight Transfers

It's essential to keep unwanted weight transfers to a minimum when driving a F1 car. Quick weight transfers caused by aggressive steering, acceleration and/or braking can upset the balance of the car and potentially make you lose control.

Weight transfers can also work in your favour. For example, lifting off the throttle briefly before entering a corner can increase the available grip at the front wheels, lead to a better turn in, and reduce understeer.

Combining Acceleration, Braking, And Steering

Smooth driving is most important when driving near the limits of your car. When taking a tight corner at high speed, the slightest aggressive input can result in loss of traction.

Traction and Grip

Grip keeps you on the road, allows you to accelerate, turn corners, and slow down when needed. However, there is a limit to grip and this is the limit of your car. It's essential to have a minimum knowledge of the basic science behind grip if you want to drive to the limit.

The Contact Patch

Let's think about the contact patch of a tire. This is the rubber that is actually in contact with the ground at any one time when you're driving.

This limited area of rubber can only supply a limited amount of grip, and for the purpose of explanation this is divided between the front to back (longitudinal) and side to side (lateral) directions.

Longitudinal grip is used up when you're accelerating or braking, and lateral grip is used when you're steering.

The key point: if you're using all the available grip in one direction (e.g. longitudinal for braking), you will not have any available in the other (e.g. lateral for steering).

Combining Lateral And Longitudinal Forces

When learning to drive fast, it's sensible to perform the most grip-demanding longitudinal and lateral actions separately. For example, don't try to steer the car under quick accelerations or heavy braking.

Applying this to a corner means braking hard on the straight before the turn, then releasing the brake fully before turning the steering. Doing this will reduce the grip demands on the tires and provide a buffer that could be used should things start to go wrong.

Professional drivers are able to combine some of the lateral and longitudinal driving elements to extract every last bit of performance from their car. Combining the braking and steering elements while cornering is known as "trail braking" and places very high demands on the tires.

Good drivers know how to get the balance of all these forces right, especially when cornering. When driving near the limit, driving smoothly is vital as the slightest driver input, such as a dodgy gear change, can exceed the total grip available and leave you heading towards anything but the track.

Weight Transfers And Grip

The total amount of grip available is not fixed. It depends on a number of factors, one of which is the amount of weight on each wheel. If you decrease the amount of weight acting on the contact patch, this artificially lowers the amount of adhesion available, and vice-versa.

When accelerating hard, you will have less grip at the front wheels. When braking, you will have more. All that is due to weight transfers.

Maximizing Traction

The best way of maximizing your car's grip is to drive using smooth driving techniques. The way you use the throttle, the brakes and your steering wheel can dramatically increase or decrease the amount of traction available.

Smooth drivers win, while the aggressive ones crash.

Increasing Grip

Grip can be increased in a number of ways, all of which are relatively easy to do. Adding down force can increase the amount of available grip by using high speed air to your advantage.

Using softer tires can increase grip in certain conditions. Softer compounds will provide better adhesion, however they wear out quicker. It's all a matter of compromise, so pick tires which best suit your driving style.

Grip And Conditions

You must remember that your tires are only 50% of the traction equation. The other 50% comes from the surface on which you drive. Dry surfaces will provide significantly more grip than wet ones, and grip even varies between different tracks. You need to adapt your driving to suit these conditions, and be aware of any environment change. It's sensible to slowly drive through an unfamiliar circuit before attempting to post fast laps.

Weight Transfers

When driving, weight transfers occur in the longitudinal (front to back) and lateral (side to side) directions. Depending on how and when the weight transfer occurs, it can be helpful or a nuisance when on the track.

The best way of understanding the effects of weight transfers is to drive a car with very soft suspension.

There are three ways that weight transfers can occur:

- Acceleration
- Deceleration
- Steering

Why do weight transfers occur?

Weight transfers occur as a result of the chassis twisting around the car's roll centre, which is determined by the suspension setup. When accelerating, braking or steering, the body of the car "tries" to keep going in the opposite direction, which compresses the suspension on this side of the car.

Acceleration

When you accelerate, the weight of the car is sent backwards. This causes the rear suspension to compress and increases the available grip at the rear tires.

Tip: Rear weight transfer helps your car accelerate.

When trying to get a good start, rear weight transfer will be to your advantage in a F1 car, as the resulting increase in rear grip will provide you with more traction and reduce wheelspin.

Note: Oversteer in a F1 car is rarely helped by acceleration, as this will increase the traction demand of the rear wheels and leave less available grip to oppose the sideways motion.

Tip: Rear weight transfer can cause understeer.

Understeer results from a lack of traction at the front wheels. When accelerating into a corner, the levels of grip at the front wheels will be reduced and your car will become more prone to continuing in a straight line despite your steering inputs.

Deceleration

Cars can brake much harder than they can accelerate. Weight transfers under braking are thus more likely to affect the balance of the car.

Tip: Forward weight transfer helps prevent understeer.

When heading towards a corner, if you turn the wheel and find yourself ploughing straight on, you've probably approached too quickly. All might not be lost. Easing off the throttle will result in a forwards weight transfer which will increase the available grip at the front wheels. This should correct your course. If you're already off the gas, a light tap on the brakes should help.

Tip: Forward weight transfer reduces traction at the rear wheels.

When aggressively jumping on the brakes, the rear wheels will tend to lock up first. This is why most cars have smaller brakes at the rear. Braking in a corner should be avoided as it can result in oversteer.

Transitions in weight transfer

To get the best times possible you need to be either accelerating or braking; any cruising means you're not going as fast as you could. When transitioning between accelerator and brake you will get exaggerated weight transfers that can further upset the balance of the car. Beware!

Steering

It's important to consider sideways weight transfers when cornering. If you turn into a corner progressively rather than "chucking it in", the weight transfer to the outside wheels will be gradual. As the outside wheels provide most of the cornering effort, the resulting progressive increase in grip can help you take corners at a greater speed. When "throwing" a car into a corner, the sudden weight transfer can unsettle the vehicle and cause sudden loss of traction.

Steering

Good steering techniques are crucial for smooth driving, as it prevents any sudden lateral weight transfers, allowing corners to be taken at a higher speed.

Driving Position

When getting ready for racing you should adjust your seat to a much more upright position than you may use when driving your personal vehicle. You need to be able to rest your wrists on the top of the steering wheel while keeping a slight bend in your arms. You may need to move closer to the wheel than you normally would. This can feel strange at first but it will give you maximum control.

Hand Position

When driving on a straight or gently curved tarmac, the normal hand position is 09:15. When taking tighter corners you will need to adjust your hand position accordingly. Grip the wheel with a firm but relaxed grip and try to maintain this position unless it is not possible to take the corner this way. This gives you the advantage of instantly knowing exactly where the straight ahead position is, and the ability to steer rapidly yet smoothly.

For a tight right hand hairpin, a suggested hand position is 07:05. This will allow the lock to be applied and taken off without taking your hands off the wheel. If your car has a large number of turns from lock to lock, you may need to start with your right hand further anti-clockwise. This doesn't apply to modern F1 cars as they don't have a large number of turns from lock to lock. A 09:15 position is recommended at all time.

Steering Movements

When steering around a corner, ideal steering movements are progressive, smooth and controlled. Applying and taking off steering lock should be done in a fluid movement, without taking either hand off the wheel. Pushing and pulling the steering wheel is fine when road driving, but it does not allow the smoothness needed when driving near the limits of grip.

Don't let the steering wheel slide through your hands when letting off steering lock. Adjust your hand position accordingly for the next corner or straight.

Steering through a corner

When steering around a corner, aim for the apex and turn in a smooth controlled arc. Don't use aggressive steering unless you are deliberately trying to unsettle the car. Once you clipped the apex, unwind the steering lock progressively as you increase the throttle. If you feel you need to tighten-up mid-corner, you've hit the apex too early. If you feel you don't need to use the entire width of the track on the exit, you've hit the apex too late.

Braking

Rammers, read this.

Braking later into corners is one of the best ways to improve your times. It goes without saying that braking is a good skill to master if you don't want to make the guy(s) in front angry. Several braking techniques are discussed here, and consideration has been made for cars with and without ABS*.

*ABS: Current F1 cars don't have ABS, but you can enable it in F1 2010 if you need it.

Good braking technique is a compromise between the two following factors:

- If you lock your front wheels, you lose steering control.
- The point of maximum deceleration is right before the point of wheel lock.

If you want to experiment the various braking techniques, please do it in a singleplayer game. In fact, do all experimentation in singleplayer games.

ABS

ABS is a great invention, by quickly applying and releasing the brakes in pulses when wheel lock is detected, it allows the driver to both slow down and steer at the same time. All you have to do is hit the brakes and wait as you gracefully come to a complete halt. In cars with ABS, anything listed here that mentions wheels locking will be irrelevant, but most racing cars, including F1 ones, are not equipped with ABS technology. That makes manual braking techniques useful for the track.

The following list shows the quickest methods for an experienced driver to slow down in high grip conditions such as a dry track.

1. Threshold Braking
2. ABS Braking
3. Locked Wheels
4. Cadence Braking

Threshold braking in the wet is much more difficult. In this case, ABS and cadence braking may well be the best methods.

Because a braking technique is not the quickest doesn't mean it should not be used, cornering ability while braking also needs to be considered. Locked wheels do not permit steering only use it when you have a clear straight line ahead.

Which is the best technique for slowing down?

This depends on what you're trying to achieve. Race drivers normally aim for threshold braking, however even the best in the world occasionally lock up wheels. In general, locked wheel braking should be avoided as it doesn't allow steering inputs and will damage the tires.

Threshold braking (ABS and non-ABS cars)

Threshold braking is the best method to adopt to gain maximum braking performance on a dry tarmac. The point of maximum braking performance is found right before the point of wheel lock. When using threshold braking drivers attempt to try and keep the braking pressure just before this point. Practically, it is very difficult to know exactly where the wheels will lock as many factors are at play such as tarmac conditions, tire choice and brake temperature.

Unless you are a professional racing driver, the best strategy to adopt is to press the brakes hard until you feel some wheels are locking, then slightly release the brakes. As you learn how your car behaves you will get better at judging the pressure needed for maximum deceleration without locking the wheels first.

ABS Braking

If you own a modern sports car, it is likely that the engineers spent countless hours fine tuning the ABS system to provide the best possible performance possible. Modern ABS systems are so good nowadays that unless you are a very good driver it can be hard to slow down more efficiently than by using the system. Even if ABS is fitted to your car, it's still better to threshold brake and prevent the system from coming into operation.

Locked Wheel Braking (Non-ABS cars)

Locked wheels aren't quite as good at slowing you down as the threshold braking technique. However there are certain situations when it's very difficult to maintain hard braking without locking wheels, such as on a wet surface.

In that case, sustained wheel lock might not be as bad as you might think; as long as you are heading in the right direction, locked wheels will slow you down effectively. Only remember that you'll be unable to steer, which leads us onto the next technique.

"I'm at Montreal, coming fast into the hairpin. I slammed on the brakes, but I just can't steer the car!"

Well, you messed-up, but all may not be lost. Keep the wheels locked for as long as possible to scrub off speed, apply a small amount of steering lock, then release the brakes smoothly and you should find that steering starts to work again.

This may be enough to stop you from destroying your vehicle. Keep applying and releasing the brakes at points where it is suitable, using small steering movements, or you'll risk understeer or oversteer. This technique works equally well in good conditions at speed, but really should only be used as an emergency procedure.

Cadence Braking (Non-ABS cars)

Cadence braking is a braking technique for very low grip surfaces such as a wet track. Essentially applying and releasing the brakes rhythmically in order to get a compromise between steering and braking performance. As you apply the brakes, the wheels will tend to lock up, slowing the car but preventing you from steering. As you release the brakes you regain steering control and can keep the car pointing in the right direction.

Attempting to use cadence braking on a good grip surface at speed will result in weight transfers which can unsettle the car, possibly resulting in oversteer. I wouldn't recommend this technique for fast driving on good grip surfaces.

Braking / Stopping Distances

If you go out to learn just one thing about your car, try to get to the point where you instinctively know what the stopping distance will be for different speeds at maximum braking effort. This is something that needs to be a split second decision, not a calculation.

Tire Choice

Tires have different capabilities; slicks are good in the dry, but poor in other conditions. Wet tarmac is less predictable than dry ones but with the right tires, good braking performance is possible. Be very careful as you recalibrate your braking points.

Understeer

Understeer occurs when traction is lost at the front wheels while cornering, forcing you wide on a bend despite applying the correct steering angle. When viewed by an outsider, it looks as if the driver has applied insufficient steering lock. If your car is understeering, you are scrubbing off speed and missing the optimum line.

Factors at Work

Passive Factors

- ✧ Weight distribution
- ✧ Drive layout
- ✧ Suspension & chassis setup
- ✧ Tire type, wear and pressures

Active Factors

- Cornering speed
- Throttle
- Braking
- Steering inputs
- Weight transfer

Symptoms of understeer

- Light steering
- Drifting towards the outside of a bend
- Possible tire noise from the front wheels

Correcting Understeer

Understeer is most likely to result from the following scenarios:

- Accelerating into a bend
- Braking into a corner
- Ploughing into a corner too fast
- Low traction conditions such as water or oil

To correct any form of traction loss, you need to consider why you've exceeded the limits of grip at the front wheels.

1. Accelerating into a bend

This is the easiest form of understeer to correct. A slight, smooth reduction in power will free up more grip (forward weight transfer), and a small corrective input to the steering will get you back on line.

2. Braking into a corner

When applying the brakes, most of the braking effort is exerted on the front wheels. So when braking into the corner you are using most of your available grip trying to scrub off speed. If you then exert some steering lock, the addition of these lateral forces on the tyre can cause the limits of grip to be exceeded. In that situation, correcting understeer seems simple; stop trying to turn the corner. However, if you are in the middle of a bend when your car starts to understeer, continuing straight on might not be the best plan. An alternative strategy could be to reduce your braking effort, freeing up more grip for steering and hopefully allowing you to take the bend successfully.

3. Ploughing into a corner too fast

If you have attempt to take a corner too fast, turn the steering wheel and find yourself running wide, you are in trouble. You've exceeded all of the available grip, but it may be possible to actually increase the level of grip by the slightest, smoothest tap on the brakes; if you're not totally out of control by pressing the brakes you're causing the weight to transfer to the front, thus artificially increasing the levels of adhesion at the front wheels. This may not work. The best is to enter the corner at a lower speed, then get on the power earlier on the way out.

4. Low traction conditions such as water or oil

If you enter a corner at speed and notice a sudden reduction in traction due to oil, disappearing water puddles or a banana skin, the best thing to doesn't exist.

If you don't crash, think about the condition and adjust your entry speed accordingly on your next lap.

Tips:

- Be smooth
- Don't enter the corner too fast
- Don't brake hard into the corner unless you are using trail braking

Trail Braking

In some situations, it may be possible to get a better time by leaving your braking to the very last minute, forcing you to maintain braking into the turn. If this is the case, ensure most of the braking effort has been carried out in a straight line, and progressively release the brakes as you approach the apex. The resulting forward weight transfer can reduce understeer and improve "turn in", however, it can also make the car more prone to oversteer.

Simple adjustments to make your car less prone to understeer:

- Reducing the front tire pressure
- Softening front springs or anti-roll bar
- Use softer front tires
- Increase front downforce

Oversteer

Oversteer, like understeer, results from the car reaching the limits of traction when cornering. In this case, the rear tires reach the limit of adhesion before the front. This leads to "the back coming out" or spinning-out. The good thing about oversteer is that you normally go to the tire wall backwards, preventing repairs to the front of your car. Performing a controlled oversteer is known as drifting.

Factors at Work

Oversteer results from a number of factors, some of which involve the natural handling characteristics of the car, and some result from the way it's being driven.

Passive Factors:

- ▣ Weight distribution
- ▣ Engine and drive layout
- ▣ Suspension & chassis setup
- ▣ Tire type, wear and pressures

Active Factors:

- ▣ Cornering speed
- ▣ Throttle
- ▣ Braking
- ▣ Steering inputs
- ▣ Weight transfer

Symptoms

You are experiencing oversteer if the rear of the vehicle becomes unstable and "light" due to the lack of grip at the rear wheels, and/or the car starts to rotate so the driver is facing towards the inside of the corner.

Causes

There are four major active causes of oversteer, but what you're likely to encounter depends on the car being driven.

Causes:

1. Entering a corner too fast
2. Accelerating into a corner, too early or too aggressively
3. Braking into a corner or mid corner
4. Lifting-off the throttle mid-corner

When Racing

Most performance and racing cars, including F1 ones, have a tendency to oversteer as they are usually developed to provide a large amount of grip at the front wheels, and a large amount of power. This means that if traction is lost it will usually be at the back first.

Preventing and Correcting Oversteer

To correct any form of traction loss, you need to consider why you've exceeded the limits of grip at the wheels. In all cases of oversteer, counter steering is also required.

1. Entering a corner too fast

Entering a corner too fast is asking for trouble, unless of course you have a very long run off to play with (Silverstone). It's not the quickest way to take a corner and leads to increased risk of oversteer. If you have entered a corner too fast, ensure that every input you make is very smooth and take the easiest route. Next time make sure you're entry speed is slow enough to maintain grip, you can build up speed as you gain experience.

2. Accelerating into a corner, too early or too aggressively

If you manage to break traction at the back when applying throttle, you're probably too aggressive. If you're spinning wheels, the power is not transferred to the road and you're not benefiting from the many horses your V8 is delivering. Gently ease off the gas and you should regain adhesion at the rear wheels.

3. Braking into a corner or mid corner

You should avoid braking in corners in most situations. Ensure braking inputs are especially smooth, gentle and progressive, and if a noob has just spun out in front of you, try steering around rather than doing an emergency stop. To correct brake-induced oversteer, smoothly but rapidly release the brake and adhesion should be back.

4. Lifting off the throttle mid-corner

If you are on the power mid-corner and close to the limit, do not lift off the throttle. The resulting forward weight transfer can upset the balance of the car and allow the rear wheels to break loose.

Counter Steering / Opposite Lock

Whatever the cause of oversteer it is important to keep the front wheels pointing in the direction you want to go. If you fail to do this, the most likely result is a spin. This technique is known as counter-steering or applying opposite lock. Beware, too little and you're likely to spin as the back continues to come round, too much and the car will spin in the opposite direction. The skill can only be mastered with practice and should become instinct.

Applying corrective steering needs to be done rapidly to catch the back of the car before it slides to a point which may be difficult to control. Once the slide has been controlled and the back starts to fall back in line, it's also important to get the steering correction off quickly too, otherwise you might find your self with oversteer in the opposite direction due to the resulting pendulum effect.

Mid-engined, rear wheel drive vehicles such as a Formula 1 car can oversteer for different reasons to front engine varieties. In this case a fairly great amount of the vehicle weight is over the rear wheels, leading to greater levels of natural grip at the back, which should lead to an inherent low risk of oversteer. However, there is another force at work here; momentum. Objects with greater mass carry more momentum and are harder to change direction at speed. In the case of mid-engined cars, the rear has more momentum than the front which can lead to a greater risk of oversteer as a result of braking or lifting off mid corner.

Simple adjustments to make your car less prone to oversteer:

If you find oversteer a problem, you can complete some relatively easy modifications which can make the handling more neutral.

- ▣ Reducing the rear tire pressure
- ▣ Softening rear springs or anti-roll bar
- ▣ Use softer rear tires
- ▣ Increase rear downforce

The Racing Line

The racing line is the route a racing driver follows in order to take track corners in the fastest possible way. By using all of the available space on the track, cars can travel in a "straighter" line and travel faster before reaching the limits of grip. Determining the racing line is an essential skill to master when racing.

The racing line depends on the following factors:

- ▣ Braking Point
- ▣ Turn-in Point
- ▣ Apex
- ▣ The position and direction of the next corner

It is important to remember that there is rarely a perfect line through any corner for all circumstances. It depends on the characteristics of your car, your cornering strategy, and the conditions.

Braking Point

How good are your brakes? How quickly can you reduce your speed from 200 mph to 60 mph? How does your car behave when the front wheels are locked? How brave are you feeling? Are you a rammer? All these factors determine your braking point. It's a sensible strategy to brake earlier as you're learning the track and your car, and progressively shorten the braking area as your experience grows. The rule of thumb is to get most of the braking out of the way before turning into a corner, although a light brake pressure on entry can help to reduce understeer and can give a better turn in. Threshold braking is the technique you should aim for, but if the wheels do lock, quickly ease off until you get it right. Try not to turn in if any of the wheels have lost traction.

Turn-in Point

To get the line right, it is vital to turn in at the correct point. Leave it too late and you'll miss the apex, too soon and you'll have to tighten your line mid-corner. Get this right and you'll have set yourself up for a good line. Remember that the apex may be further round the turn than you can see, so make sure you learn the track and the apex points before driving in anger.

Apex

The apex is the point at which you are closest to the inside of the corner, also referred to as the clipping point. Once you have hit the apex you should be able to reduce the steering lock and increase the throttle. Determining the apex can be tricky.

There are two different types of apex, the geometrical apex and the racing apex. The geometric apex of a constant radius corner is the central point on the inside and this may also be the racing apex, which depends on the context.

This is where your strategy comes into play. There are several generic strategies for cornering including:

- Carrying speed in the corner
- Minimizing the severity of the turn
- Getting the power on early

The Geometric Apex

To carry maximum speed through a corner, you need to take the route that minimizes the tightness of the corner arc. This minimizes cornering force and frees up precious grip for maintaining speed. This route tends to use the geometric apex of the corner and is usually known as the classic racing line.

Pros of traditional racing line:

- Smooths out corners in the most efficient way
- Maintains momentum
- Maximizes fuel economy
- Reduces the chances of understeer or oversteer
- Preserves the life of tires

Cons of traditional racing line:

- Not necessarily going to yield the fastest possible lap times.

Racing Apex

Oddly enough, carrying the highest average speed round corners may not actually be the quickest way around a track. If the corner leads onto a straight it can be better to take a late apex, straighten the car out early and get the power on for a high speed exit. This is generally regarded as the best strategy for racing, with a slightly lower entry speed but a faster exit speed. The amount of grip available is the factor which determines how late you can brake and apex.

Pros of the modern racing line:

- Increases the chances of a fast lap
- Allows the power to be applied earlier
- Maximizes the use of any straights following the corner
- Allows late braking.
- Useful for overtaking on a corner

Cons of the modern racing line:

- Greater demand on the tires.

Common Mistake:

It's very common for drivers to apex too early due to nerves about the approaching corner and eagerness to take the turn. The racing line apex which is often out of view at the point of turn in, or further round the corner than you expect. This is where experience and track knowledge come in.

Hairpins

A hairpin is a corner which turns 180 degrees. In this case, the apex for the racing line is about three quarters of the way around the bend. A useful guide is that half way through the turn you should be roughly in the middle of the track.

The Next Corner

The position and direction of the next corner also affects the choice of line. For example, if the next bend is a left hander you'll need to move over to the right hand side of the track, and thus will need to apex later and take a tighter, slower line. However, if the next corner is another right hander a wider, faster arc can be used.

Once the optimum route through the corner has been determined, it's time to negotiate the turn in the quickest way possible. To do this will, you need a decent knowledge of your car's limits, some time to learn the track, and a combination of car-control techniques.

Corners:

Corners can be divided into 7 distinct zones:

- Braking Zone
- Gear Change
- Turn-in Point
- Neutral Throttle (or Trail Braking for experienced drivers)
- Apex
- Acceleration
- The Next Corner

Braking Zone:

Apply the brakes hard at your pre-determined braking point using the threshold braking technique. Due to the forward weight transfers, there is a possibility that you may lock up one or more wheels, but as you're traveling in a straight line this will not necessarily cause any detrimental effects. Ensure that you have come off the brakes, or reduced braking to a minimum before you turn in. As you learn the track and your tires warm up you will be able to leave the braking point later.

Gear Change

Before you turn into the corner you'll usually need to downshift. The golden rule here is to select a gear which will allow you to accelerate out of the bend efficiently.

Turn-in Point

When turning in, ensure your steering motion is smooth and progressive. The perfect corner involves tightening the steering until the apex and then gradually unwinding the steering lock. If you find yourself increasing or correcting the steering lock as your traveling through the corner after the initial turn-in you've probably taken the wrong line.

Neutral Throttle:

The largest demand on the grip reserves of your tires occurs between the turn in point and the apex. It is vitally important not to place additional demands on the tires by accelerating or braking. This isn't to say you can't retain a constant speed, but the important factor is that the car is in a neutral state until after the apex. Understeer or oversteer are most likely to occur at this point.

Trail Braking (for experienced drivers):

Once you have mastered the racing line and the various stages of driving through a corner, you might consider taking things one step further with trail braking. This involves braking later and continuing to brake into the early phase of the corner before the apex. This can help improve your lap times, but also pushes your car closer to the limits of grip.

Trail braking should be considered in the following situations:

1. If you have a car which naturally understeers, feathering the brake into a corner will maintain a forwards weight transfer and can provide additional grip at the front wheels. This can sometimes allow a faster cornering entry, but the success rate depends on the setup of your car.
2. If you find you have ploughed into a corner too fast and feel that there is a risk you might not be able to remain on the track, trail braking can help. Remember though that the less braking you can get away with mid-corner the better. So only use as much braking as you absolutely need to. This will leave you with greater reserves of grip which can be used to keep you on the track while cornering. This technique should be treated as a method of recovery rather than a matter of habit.

3. Once you have cornering down to a fine art, trail braking is a method of further improving your lap times. When performing this technique at speed, it's important to remember that the majority of the braking should still be completed in a straight line. However to squeeze every last ounce of performance from your car, you can start to leave your braking point slightly later and continue to use the brakes in the corner prior to the apex. Before you turn in, progressively start to ease off the brakes until they are fully released at the apex ready for the acceleration phase. Some cars do not react well to trail braking, especially those prone to lift off oversteer. Although there will be more grip available at the front wheels while trail braking, the rear will be more prone to break lose. Beware!

Apex:

When hitting the apex don't be worried about cutting the corner slightly. During a corner, the weight is transferred to the outside wheels, thus these are doing most of the gripping. Putting the inside wheels slightly onto the kerb shouldn't be too much of an issue.

Acceleration:

Once you've hit the apex, you should be able to start reducing the amount of steering lock. As you are doing this progressively increase the throttle up to the point of full power. The point at which you can apply full power depends on your car. Some cars will be able to apply full power straight after the apex, depending on the severity of the corner.

The Next Corner:

By now you should already be thinking about the next corner and position your car appropriately to allow you to use the racing line.

It's very rare to achieve the perfect corner, it takes knowledge of the track and the car and a great deal of practice!