

Stopping Distance

Stopping Distance

Welcome to this **Perfect Driver** course. Throughout this course, we are going to look at the law, skills, techniques, and ideas to help you become a better, and safer driver.

In this lesson, we'll look at **vehicle stopping distance, driver reaction times**, and other **variables that can affect stopping distance**.

Stopping Distance



Let's take a closer look at
Stopping Distance.

Stopping Distance

Stopping Distance

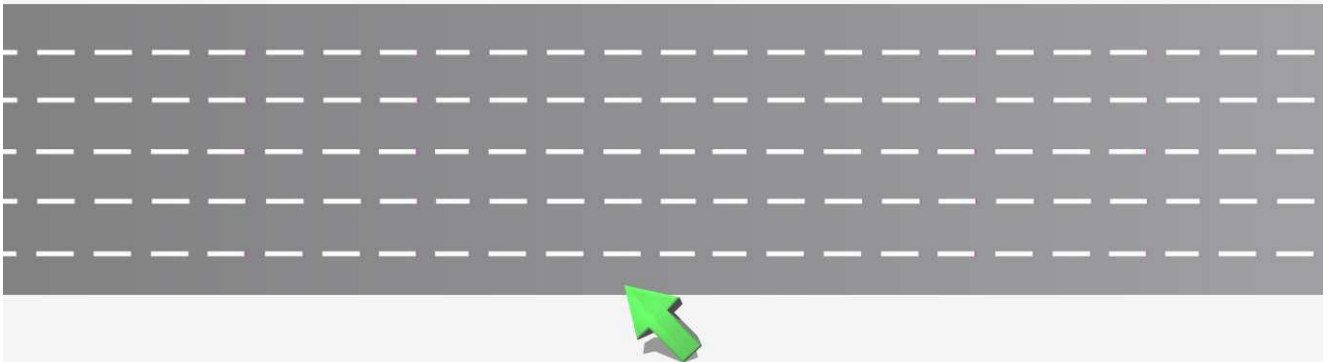
Probably the most important safety feature in a car is how long it takes that car to stop. How long this takes depends on the driver, car, technology in the car, and other variables we discuss shortly.

Cars over the last 20 years have added many safety features and improved others. In general, a car can come to a stop much more quickly and safely today than ever before. And things are only getting better.

But, even so, there are some important factors to consider to help you brake safely and quickly. And we'll cover these in this lesson.

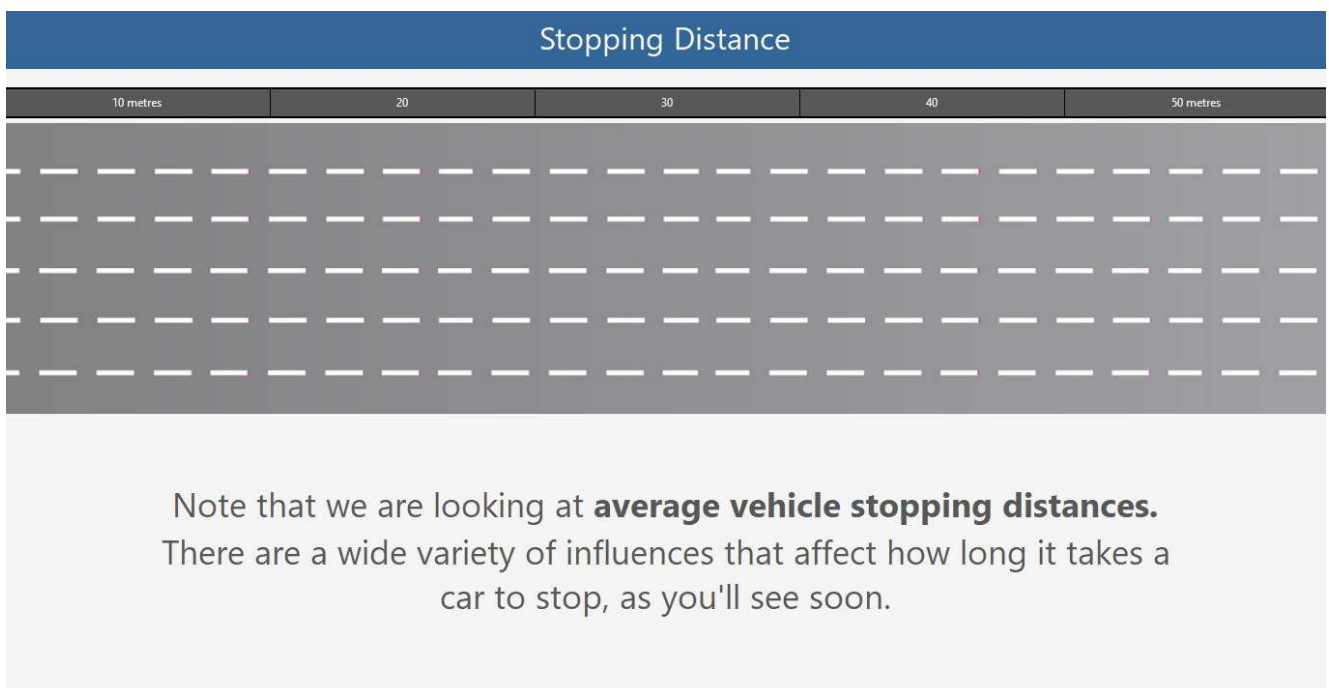
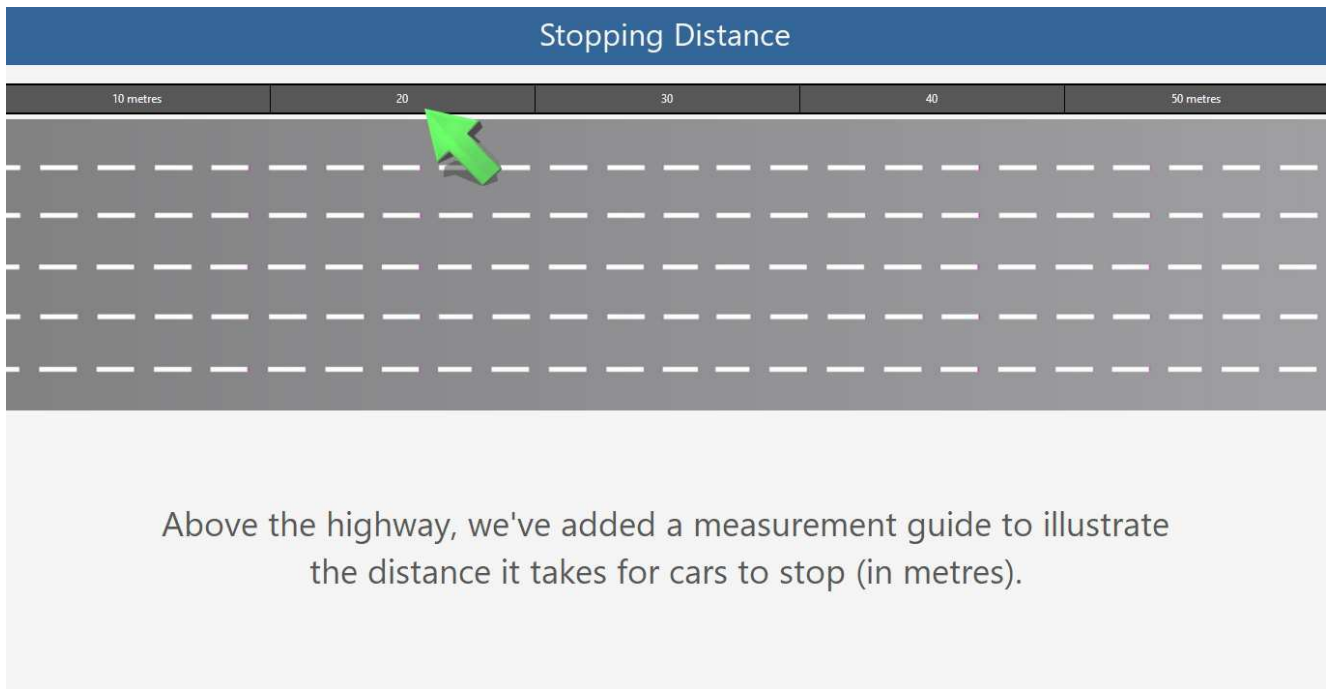


Stopping Distance



Above, we will use this simulated six lane highway to illustrate the average stopping distance of cars at various speeds.

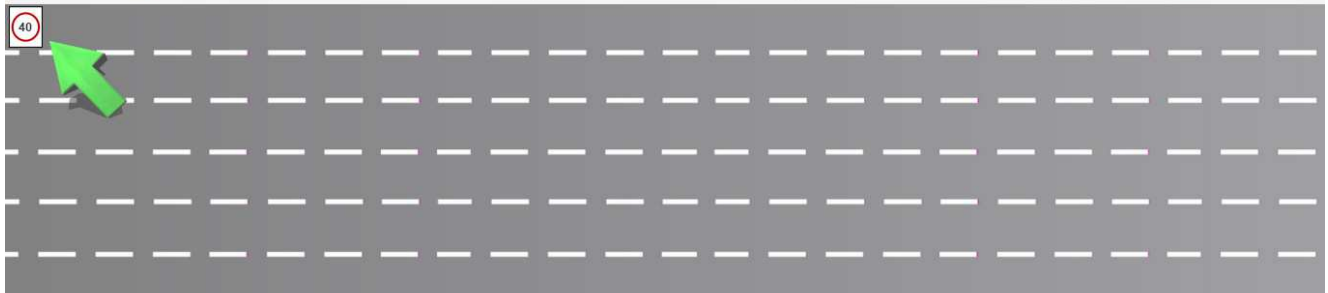
Stopping Distance



Stopping Distance

Stopping Distance

10 metres	20	30	40	50 metres
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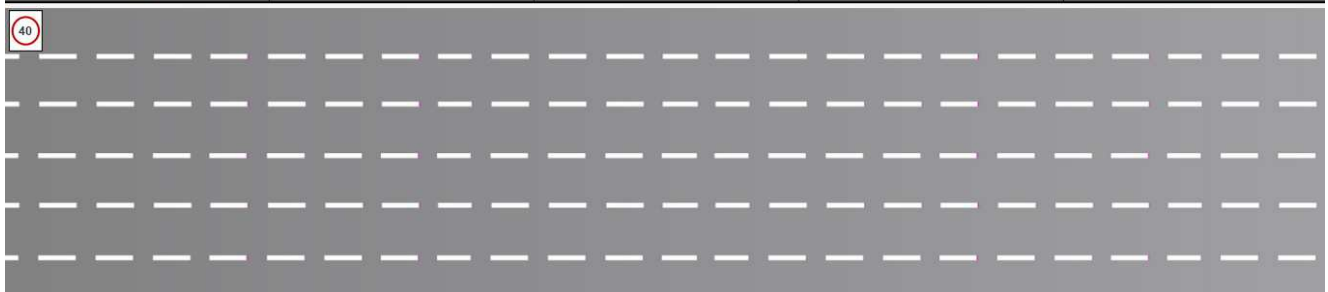


In the top lane, let's look at how long it takes a car travelling at **40km/h** to come to a stop.

In a moment, you'll be given the chance to guess that distance before we show you.

Stopping Distance

10 metres	20	30	40	50 metres
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How far do you think it will take a car, travelling at **40km/h**, to stop?

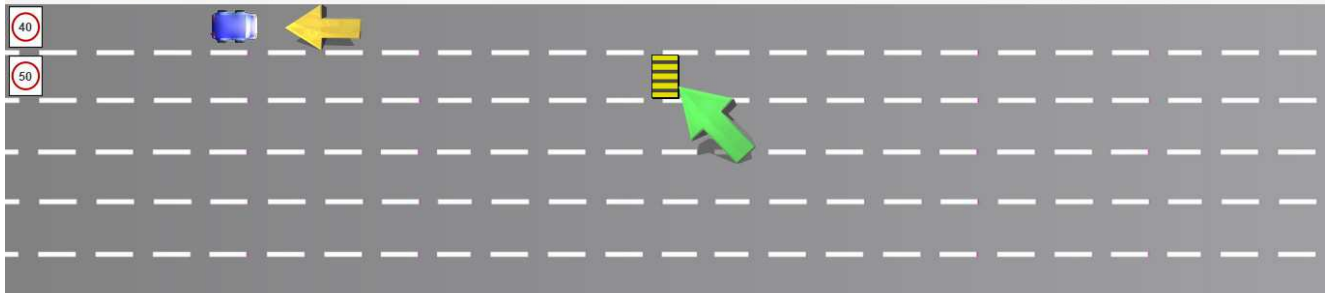
Drag the marker indicated by the green arrow to set where you think the car will stop.

SHOW ME

Stopping Distance

Stopping Distance

10 metres	20	30	40	50 metres
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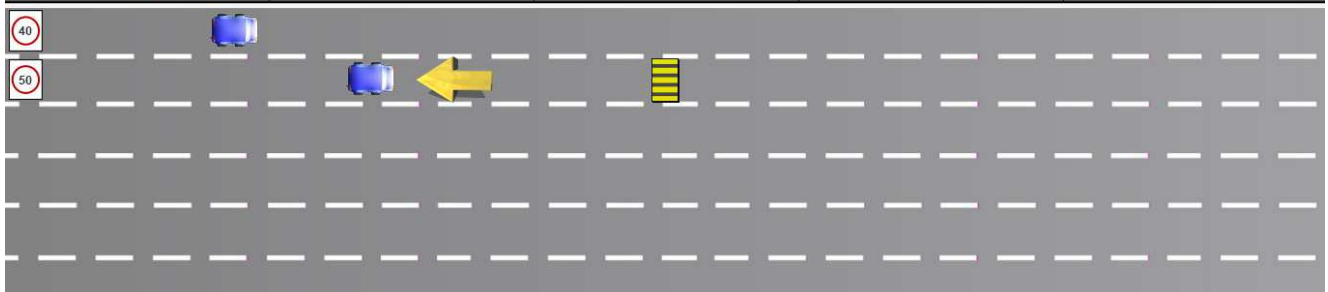
At **40km/h**, the braking distance of the average car is **9 metres**.

Let's see how long it takes to stop when travelling at **50km/h**. How far do you think it will be? **Drag the marker indicated by the green arrow to set where you think the car will stop.**

SHOW ME

Stopping Distance

10 metres	20	30	40	50 metres
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At **50km/h**, the braking distance of the average car is **14 metres**. That is a **155%** increase over **40km/h**.

The extra 10 km/h (from 40 to 50) nearly **doubles** the distance a car takes to stop.

Stopping Distance

Stopping Distance



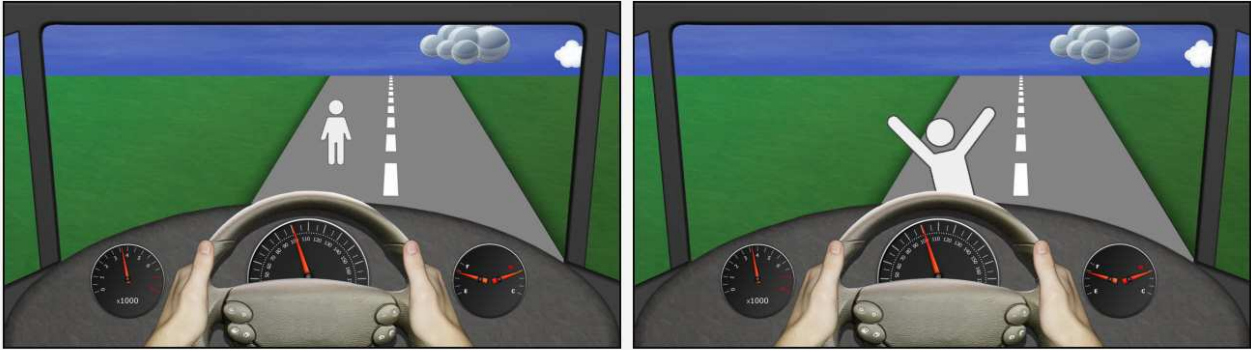
The diagram shows a road with a pedestrian crossing marked by white zebra stripes. Above the road, a scale indicates distances of 10 metres, 20, 30, 40, and 50 metres. On the left side of the road, there are two circular speed limit signs: one for 40 km/h and one for 50 km/h. A blue car is positioned on the road, and a yellow arrow points towards the pedestrian crossing. A yellow bus is also visible further ahead on the road.

Take a look at the pedestrian crossing we've now added.

That extra ten kilometres an hour added to your speed means you could drive right through a pedestrian crossing - with potentially catastrophic results.

Stopping Distance

That extra stopping distance - **5 metres** for only an extra **10km/h** - is it worth the view on the right?



The two illustrations show a driver's perspective from inside a car. The left illustration shows a pedestrian crossing ahead with a white pedestrian figure. The right illustration shows the same scene but with the pedestrian figure raised in the air, indicating a collision. The driver's hands are on the steering wheel, and the car's dashboard with a speedometer and tachometer is visible.

Stopping Distance

Stopping Distance

10 metres	20	30	40	50 metres
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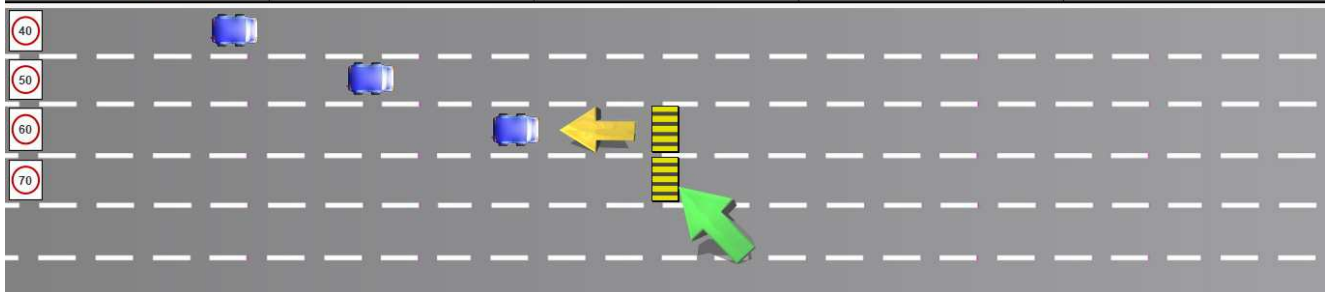
OK, now let's see how long it takes to stop when travelling at **60km/h**.

How far do you think it will be? **Drag the marker indicated by the green arrow to set where you think the car will stop.**

SHOW ME

Stopping Distance

10 metres	20	30	40	50 metres
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At **60km/h**, the braking distance of the average car is **20 metres**. A **222%** increase over **40km/h**.

Let's see how long it takes to stop when travelling at **70km/h**. How far do you think it will be? **Drag the marker indicated by the green arrow to set where you think the car will stop.**

SHOW ME

Stopping Distance

Stopping Distance





10 metres	20	30	40	50 metres
40				
50				
60				
70				

At **70km/h**, the braking distance of the average car is **27 metres**. A **300%** increase over **40km/h**.

The extra speed, from **40km/h** to **70km/h**, **triples** the amount of distance taken to stop the car.
Less than *double* the speed, but *triple* the stopping distance.

Are you seeing a pattern?

Stopping Distance

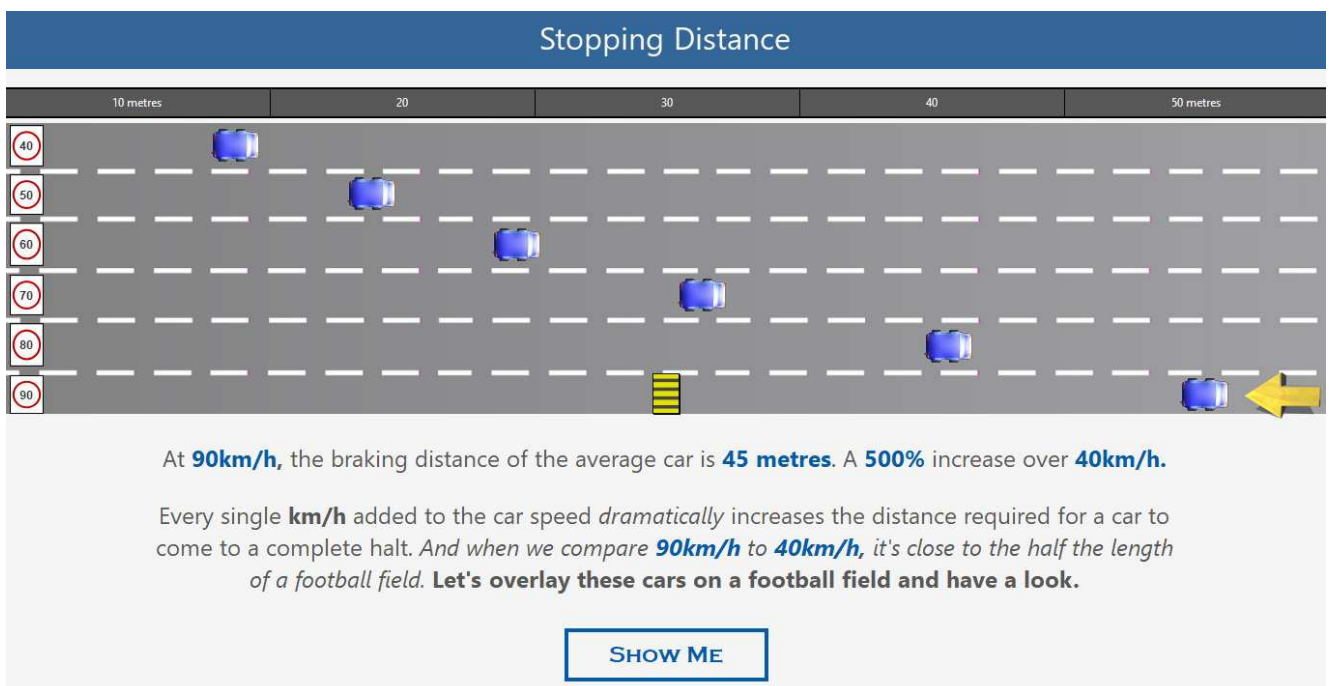
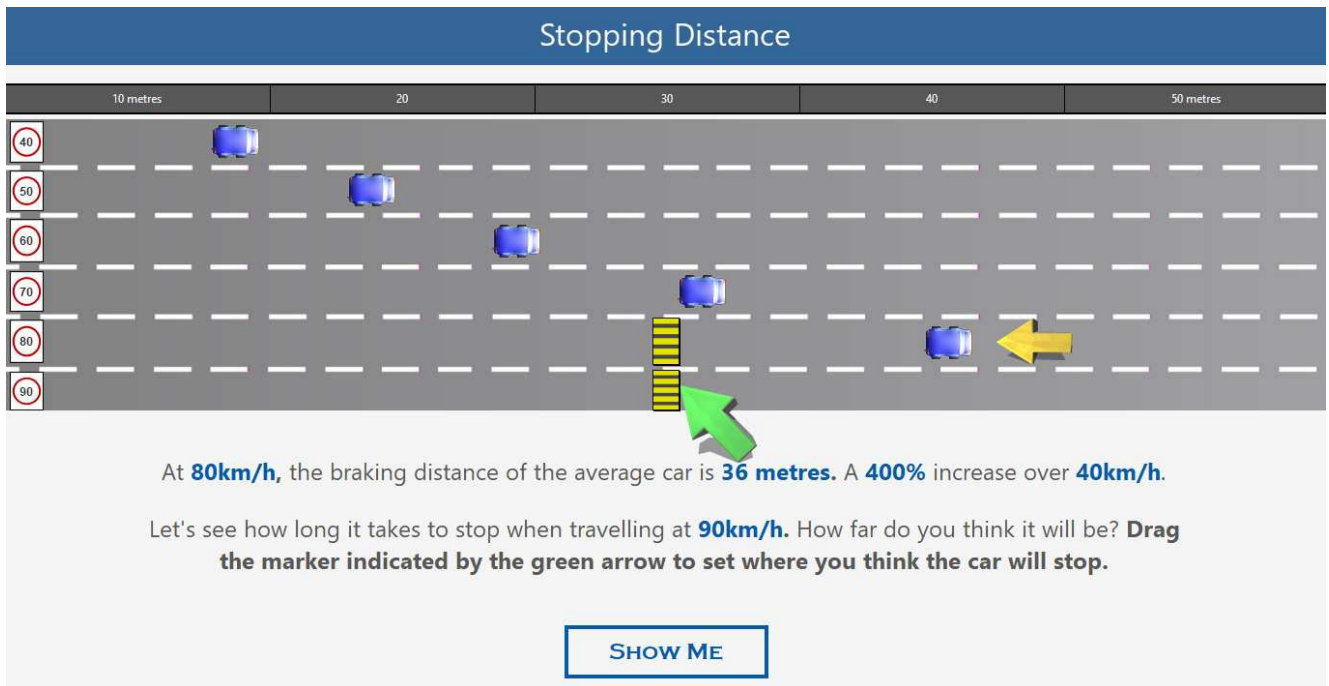
10 metres	20	30	40	50 metres
40				
50				
60				
70				
80				

Let's see how long it takes to stop when travelling at **80km/h**.

How far do you think it will be? **Drag the marker indicated by the green arrow to set where you think the car will stop.**

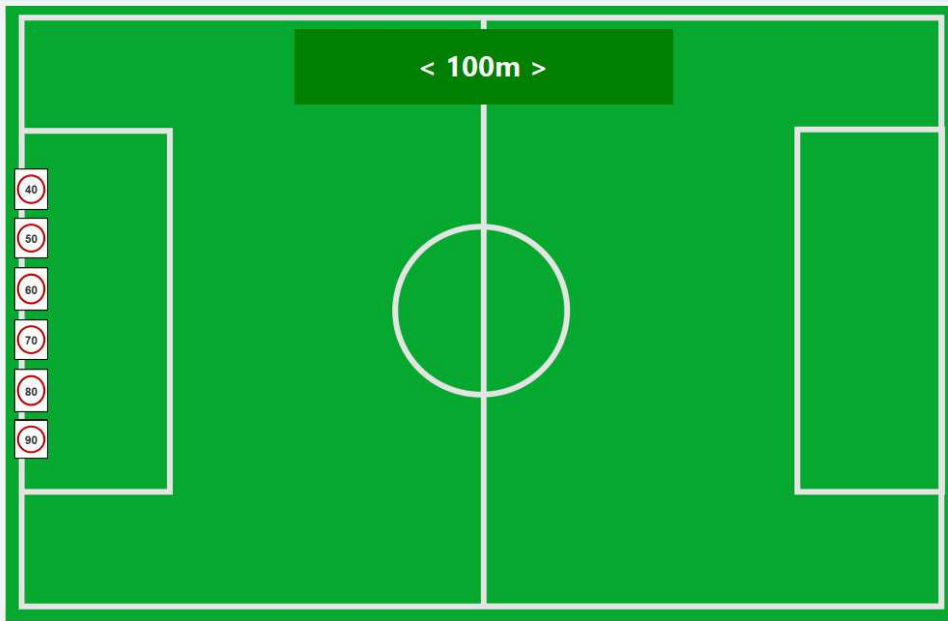
SHOW ME

Stopping Distance



Stopping Distance

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Stopping Distance



Now let's take a look at what happens when we add **driver reaction time to the mix.**

Stopping Distance

Stopping Distance

In these examples, we've illustrated how long a car takes to stop from given speeds. But so far, we've only looked at actual braking distance.

Before you can put the brakes on, there is your **reaction time** to account for. This is the time it takes for you to realise that you need to apply the brakes.

The average human reaction time for a visual cue is .5 to 1 seconds. This means that if you see an obstacle, car, or person ahead, and you need to stop, it can take 1 second or more before you are able to even *start* stopping the car.

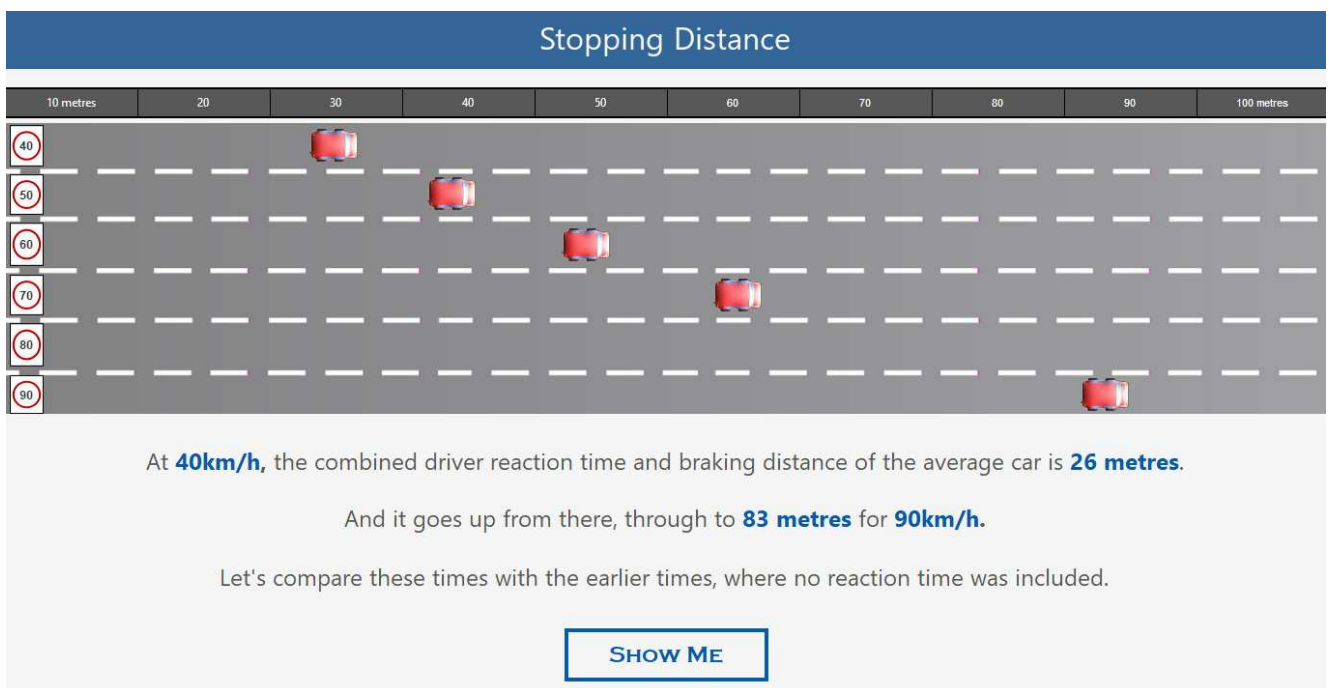
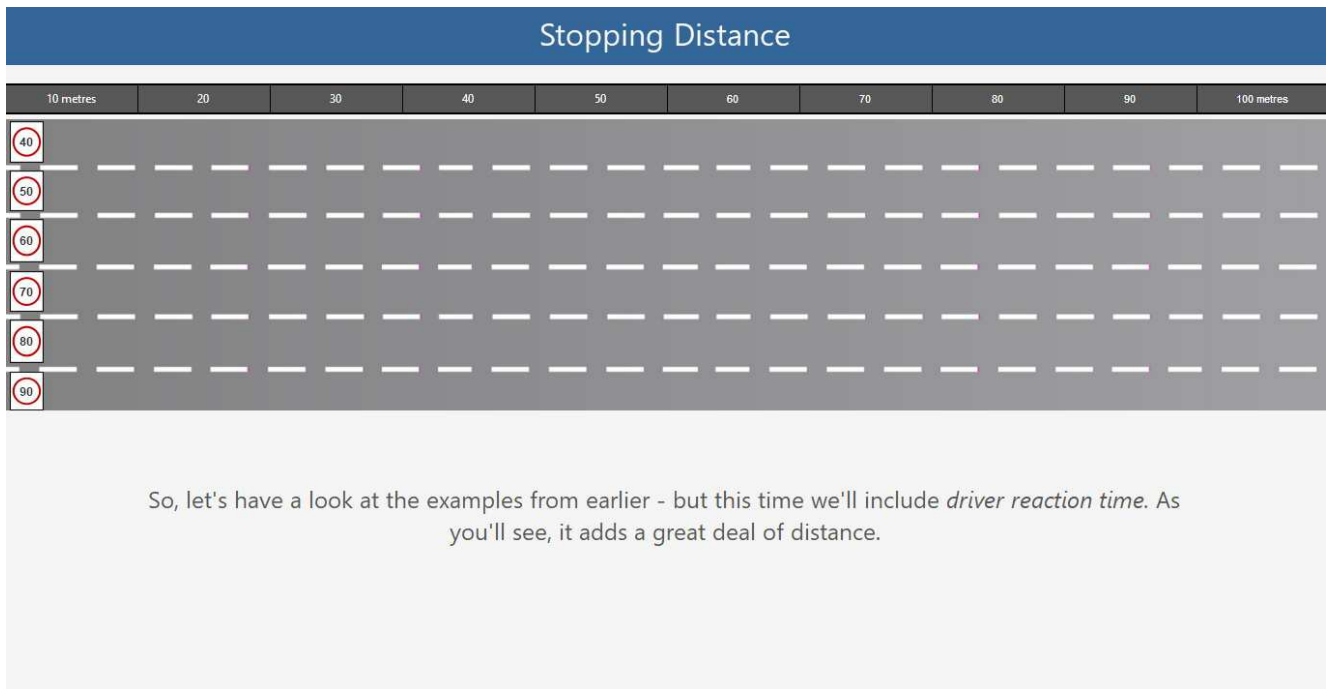


Stopping Distance

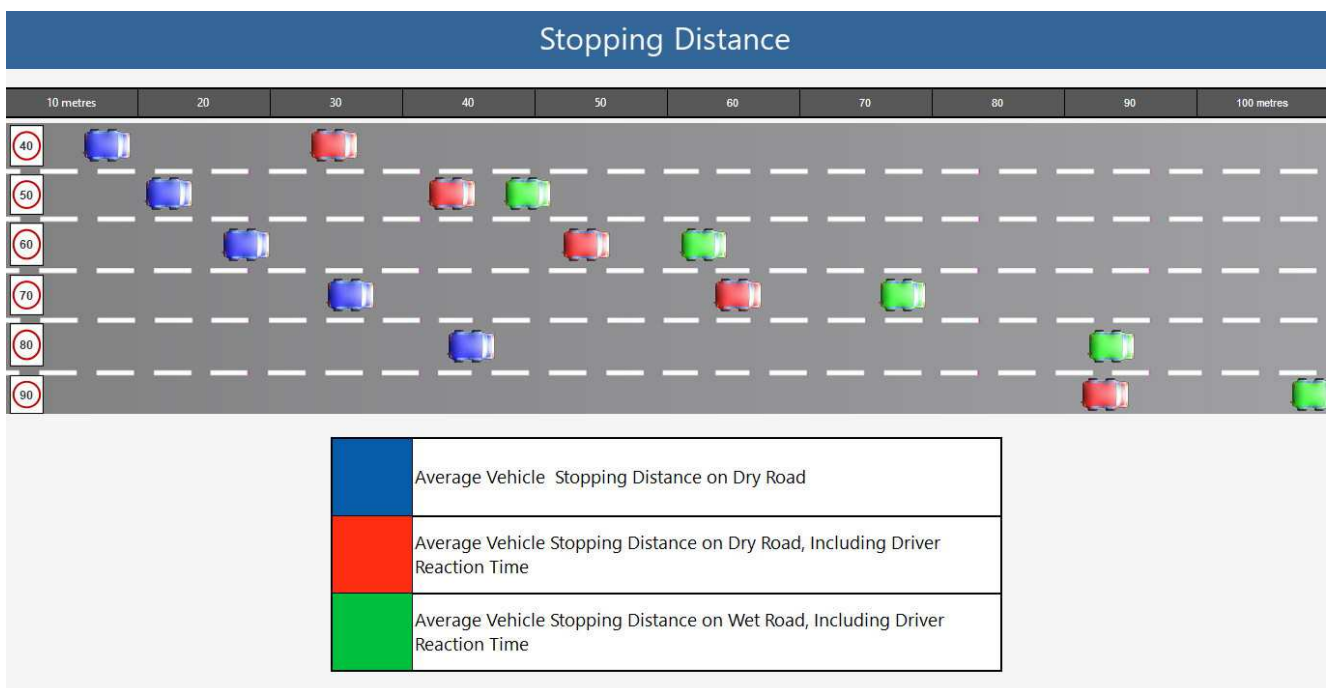
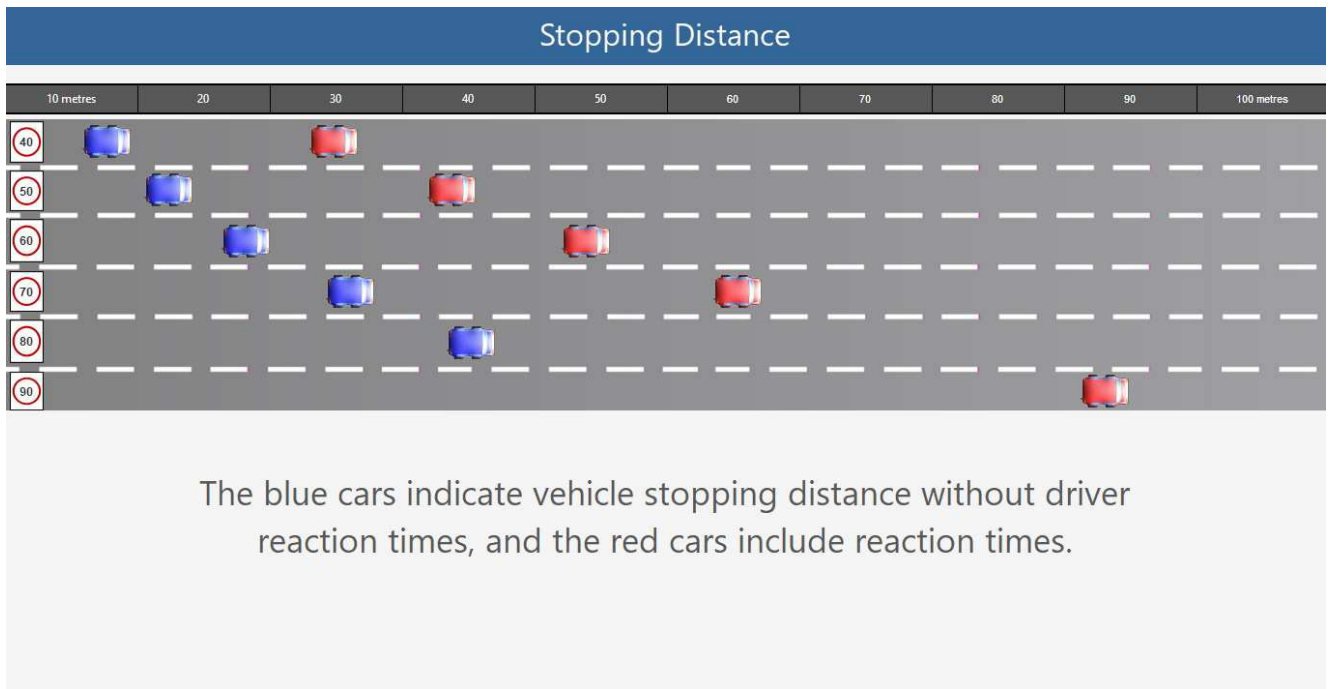
The table below indicates just how far you will travel at certain speeds before you even **realise** you need to apply the brakes.

Speed	Distance Travelled
40km/h	17m
50km/h	21m
60km/h	25m
70km/h	29m
80km/h	33m
90km/h	38m
100km/h	42m
110km/h	46m

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Finally, let's take a look at some important factors that influence **how long it takes to come to a complete stop.**

Stopping Distance

So far, we've looked at stopping distances in cars, but we have not looked at any variables that can **influence** stopping distance.

Let's have a look at some of those now.



Stopping Distance

Factors that affect braking distance: Brakes.

It is vital that your car brakes are maintained well for best performance.

Brakes rely on friction to stop the car, and this results in wear - the brakes wear out. Sometimes, this wearing out can lead to imperfections in the brake surface that increase stopping distance.



Water affects brakes. If you've driven through water, or your wheels have become effectively soaked, pump the brakes a few times as you start off, and it will help remove the water from the braking system.

Stopping Distance

Factors that affect braking distance: Two Stage Braking.

The most effective braking you can do is performed in two stages:

- First, apply only light pressure to the brake, and pause.
- Second, firmly apply more pressure to the brake to get the effective braking capacity.

This technique can help you stop quickly, with more control.



Stopping Distance

Factors that affect braking distance: *Brake Failure.*

If it appears that your brakes have 'failed', don't panic. Release the brake, and give it another try. It is unlikely that they have completely failed, and there may be enough stopping power to bring you to a halt.

Failing that, you can use the gears - even on an automatic or semi-automatic car - to slow the car down substantially. Change into lower gears, and the car will slow.

Look for an escape route - a ramp, a clear area, somewhere safe to head if worst comes to worst.



Stopping Distance

Factors that affect braking distance: *Type of Brakes.*

Brakes tend to come in two different varieties - **drum**, and **disc**.

Disc brakes are a newer technology, and are less likely to overheat. On performance and racing vehicles, you'll tend to find all four wheels use disc brakes.

On most cars today, you'll tend to find a disc (front wheels) and drum (rear wheels) brake combination is used.



Disc brakes, like those seen here (red), generate less heat than the older drum type brake system. These brakes are more open, allowing more air to flow through, and cool the system.

Stopping Distance

Handbrakes

All cars contain handbrakes (parking brake), normally located near the gearstick.

It is vital that the **handbrake is not used** to slow down or bring a car to a stop. Handbrakes must only ever be engaged when a car has already stopped, like when you have parked.

Using a handbrake while driving can be extraordinarily dangerous, and may put your car into an uncontrollable skid.



*Never use **the car handbrake** to bring a car to a stop.*

Stopping Distance

Factors that affect braking distance: Anti-lock (Anti-skid) braking.

Anti-lock, or anti-skid braking (ABS) is a vehicle safety feature built into all new cars, and in many other cars over the last 15 years.

ABS works by preventing the wheels from locking up - stopping spinning - under heavy braking. This prevents the car from skidding, and the subsequent loss of driver control this brings.

In *most* circumstances, this means shorter stopping distances - but *not* on loose surfaces, like gravel or snow.



Perhaps the main advantage of ABS is that the wheels never 'lock up', so the driver can still steer the vehicle to avoid an obstacle. This is a major safety feature - as if a car begins to skid (where the wheels lock up), steering is impossible - you'll go in a straight line no matter where you point the steering wheel.

Stopping Distance

Factors that affect braking distance: *Auto braking.*

Auto braking, or brake assist, is a car safety feature that uses various sensors (cameras, radar, lidar) to automatically apply brakes if a collision is imminent. It generally only is active at relatively lower speeds, but the as the technology improves, it will become used at all speeds.

There is little doubt that given time, this sort of safety feature will be available in all cars - it is said to reduce rear end crashes by 39% or more.



*Tesla is one manufacturer with many **Automatic Emergency Braking System**, as it calls it, models.*

*Auto braking is also called **advanced emergency braking system (AEBS)** or **autonomous emergency braking (AEB)**.*

Stopping Distance

Factors that affect braking distance: *Suspension.*

It is vital that your car's suspension system is maintained well for best performance.

While suspension systems are there to ensure a smooth ride, they can also affect braking. Worn shock absorbers may cause bounce, or skidding, under heavy braking, and increase stopping distance.



There are various forms of suspension or shock absorbers in cars - but all require regular maintenance to ensure they are operating correctly.

Stopping Distance

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Factors that affect braking distance: Road Surface.

Of course, the road surface plays a role in how long it takes to stop. Wet, icy, snowy or oily roads, roads covered by gravel or other loose items, the road surface itself, will all likely increase the amount of distance and time to stop.

Bottom line is that you must be more careful - leave more room between you and the car in front - whenever road conditions are less than perfect.

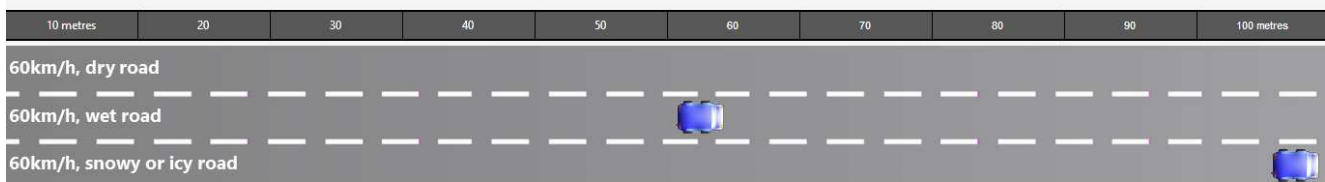


In slippery conditions, (quite apart from driving more slowly in the first place) you can also use gears to help slow you down. Changing to a lower gear, in combination with braking, will slow the car with less risk of skidding.

We cover this in more detail in another lesson.

Stopping Distance

60km/h, road surface comparison.



Above, you can see how long, comparatively, it takes for a car to stop on different road surfaces.

Snow and ice surfaces vary in slipperiness - and stopping may take from 5 to 10 times the dry road distance.

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Factors that affect braking distance: Tyres.

There are three factors related to your car tyres that can dramatically affect stopping distance.

- **Tyre quality.** Higher quality tyres - even of the same size and age of budget tyres - can reduce stopping time dramatically.
- **Tread.** The more tread on the tyre, the less distance you require for stopping. The tyre is just able to get a better grip on the road. Even road legal tyres with the minimum legal depth of tread will take much longer to stop than brand new tyres.
- **Tyre pressure.** If your car tyres are overinflated, or underinflated, it can reduce the contact of the tyre with the road, and increase stopping distance.



Tyre type, inflation level, and tread depth are three very important variables in braking distance.

Wider tyres do not necessarily mean better stopping. It's not a simple equation. In some cases, wider tyres can have less rubber in contact with the road - but they are better at dissipating heat and protecting the tyre.

Stopping Distance

Factors that affect braking distance: The car.

Expensive - shall we say supercars - are built for speed, and quite often have brakes to match.

A *Porsche 911 GT3*, for example, with a full set of *huge* disc brakes, large, expensive tyres (and other car safety features) can **almost halve** the distance an average car takes to come to a complete halt from 100km/h.

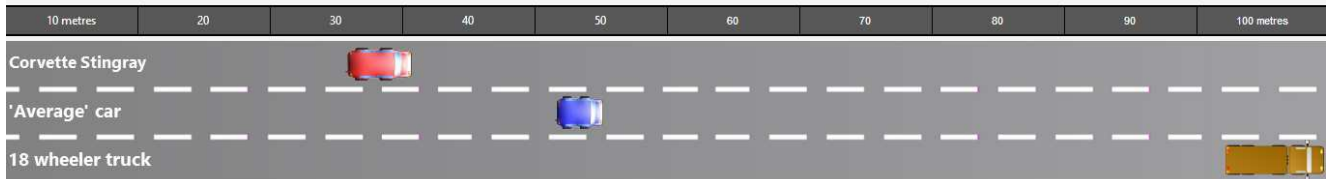


You don't have to spend a million dollars. There are many cars not in the supercar league that can decrease stopping distance dramatically when compared to cheaper cars.

Stopping Distance

Stopping Distance

60km/h, dry road, vehicle comparison.



We can't all afford a **Chevrolet Corvette Stingray Convertible**, but, for your information, here is an indication of just how impressively they can come to a halt.

Stopping Distance

Factors that affect braking distance: *Distractions.*

We cover this more in a different lesson, but the more distractions you have or distracted you are, the longer it will take for you to react and start braking.

Distractions include mobile phones, satellite navigation systems, conversations, eating, tiredness, inattentiveness, and much more.



Hands free satellite navigation systems are not just recommended - they are mandatory if you want to use a phone while driving.

Stopping Distance

Stopping Distance

Factors that affect braking distance: *Alcohol and Drugs.*

We cover this more in a different lesson, but we are all aware that alcohol and drugs can vastly affect driver reaction times, and vastly increase stopping distance.



Alcohol and other drugs are one of the greatest causes of accidents and loss of life in motor vehicle accidents. This includes not only illegal drugs, but prescription drugs - particularly combinations of prescription drugs.

Stopping Distance

Factors that affect braking distance: *Weight of the car.*

The **weight** of a car is also a consideration, but it is not really a linear or simple relationship. A large 4WD is more likely to take longer to stop than a smaller sedan, but there are other factors in play. The extra weight *may* give tyres more grip, as more weight is pressing down on these tyres.

Many cars have spoilers (*bottom right image*), or other devices (generally performance vehicles) that create a downforce on the car - giving the tyres more grip, and reducing stopping distance. This applies in both cornering and braking.



The extra weight, along with bigger tyres and more grip, can offset what may appear to be a disadvantage in larger cars like a 4WD.



Stopping Distance

SUMMARY

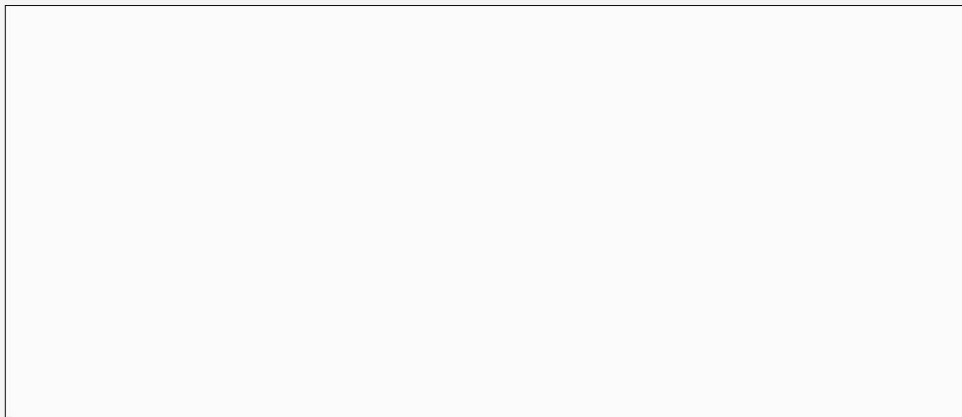
In this lesson, we looked at the distance required to come to a complete stop in your car. We discussed:

- Stopping distance at various speeds.
- Driver reaction times.
- Various factors affecting stopping distance.

FINISH LESSON

Stopping Distance

Signature. It is very important that you use the mouse, or touch, to *sign* the form below. This helps us record your progress accurately.



SUBMIT SIGNATURE

CLEAR SIGNATURE

Stopping Distance

Welcome to this **Perfect Driver** course. Throughout this course, we are going to look at skills, techniques, and ideas to help you become a better, and safer driver.

In this lesson, we discussed factors related to **vehicle stopping distance**.



Stopping Distance

