

# KhanaKids

Junior Development Program

## Instructor Notes



Version 3 – November 2017

# KhanaKids Junior Development Program:

SUPPORTED BY



# Tasmanian Government



Khanakids is a junior development program created by the 500 Car Club of Tasmania Incorporated (ABN 29 681 214 254). If you would like information about this program please contact the Club's Committee on the details below:

500CC Committee

GPO Box 119

Hobart TAS 7001

Email: [committee@500CC.com.au](mailto:committee@500CC.com.au)

Website: [www.500CarClub.com.au](http://www.500CarClub.com.au)

# Contents

1	Introduction for Instructors .....	2
1.1	Instructors.....	2
1.2	Students.....	2
1.3	Vehicles .....	3
1.4	The Course.....	4
1.5	How are training events conducted .....	6
1.5.1	<b>The Student Briefing</b> .....	<b>6</b>
1.5.2	<b>Emergency or Incident Procedures</b> .....	<b>7</b>
1.5.3	<b>Introduction to the Vehicle</b> .....	<b>7</b>
1.5.4	<b>Driving exercises</b> .....	<b>8</b>
1.5.5	<b>Debrief from driving exercises</b> .....	<b>8</b>
1.5.6	<b>Practical/Theory discussions and Maintenance</b> .....	<b>9</b>
1.5.7	<b>Student debrief</b> .....	<b>9</b>
1.5.8	<b>Feedback Forms and record keeping</b> .....	<b>9</b>
2	Introduction .....	11
3	What is KhanaKids?.....	11
4	Vehicle basics .....	12
4.1	What is a vehicle? .....	12
4.2	Vehicle Controls .....	12
4.2.2	<b>Pedals</b> .....	<b>12</b>
4.2.3	<b>Steering Wheel</b> .....	<b>13</b>
4.2.4	<b>Gearstick</b> .....	<b>13</b>
4.2.5	<b>Handbrake</b> .....	<b>13</b>
4.2.6	<b>Ignition/Keys</b> .....	<b>13</b>
4.3	The Engine .....	13
4.3.2	<b>What is an engine?</b> .....	<b>13</b>
4.4	The ignition.....	14
4.5	Accelerator .....	14
4.5.2	<b>What is a gearbox?</b> .....	<b>15</b>
4.6	The clutch .....	15
4.7	Brakes .....	16
4.7.2	<b>The Brakes</b> .....	<b>16</b>
4.7.3	<b>Braking</b> .....	<b>17</b>
4.8	Suspension.....	17
4.8.2	<b>What is suspension and what does it do?</b> .....	<b>17</b>
4.9	Wheels and Tyres .....	18
4.9.2	<b>Tyre Tread</b> .....	<b>19</b>
4.9.3	<b>Tyre Pressure</b> .....	<b>20</b>
4.10	Additional information .....	20

**4.10.1 For more about how vehicles work see:..... 20**

**4.10.2 For good information about maintaining and servicing vehicles see: ..... 20**

**4.10.3 For technical information about vehicle aerodynamics and about advanced driving techniques see: ..... 20**

4.11 Vehicle Maintenance ..... 21

4.12 How to change a tyre..... 21

4.13 How to check tyre pressure ..... 22

4.14 How to check engine fluid levels..... 22

**4.14.1 Brake fluid..... 22**

**4.14.2 Coolant ..... 23**

**4.14.3 Engine oil ..... 23**

5 Driving techniques ..... 24

5.1 Set your seating position..... 24

**5.1.2 Why is the seating position important?..... 25**

5.2 Start and stop a vehicles engine..... 26

**5.2.2 Why is the starting procedure important? ..... 26**

5.3 Stopping a vehicles engine..... 26

**5.3.1 Why is the stopping procedure important? ..... 27**

5.4 Steering..... 27

5.5 Manual Vehicles ..... 27

5.6 Move off (Manual Vehicles) ..... 27

5.7 Stop (Manual Vehicles) ..... 28

5.8 Change up gears (Manual Vehicles) ..... 28

5.9 Change down gears (Manual Vehicles) ..... 28

5.10 Automatic Vehicles..... 29

5.11 Move off (Automatic Vehicles)..... 29

5.12 Stop (Automatic Vehicles)..... 29

5.13 Changing gears in an automatic vehicle..... 29

6 Driving Tasks ..... 31

Driving exercise 1 ..... 31

Driving exercise 2..... 32

Driving exercise 3..... 33

Driving exercise 4..... 34

Driving exercise 5..... 36

7 Quick Guide..... 38

8 Completed Tasks..... 39

8.1 Vehicle Maintenance Exercises..... 39

8.2 Completed Driving Exercises..... 39



# 1 Introduction for Instructors

KhanaKids has been written as a guide for instructors and students who have little to no driving experience. It is intended that instructors use this document as a basis for discussion, and as an aid to instructing new drivers with the aim of providing these young/new drivers a valuable introduction to driving and also provide a sound footing on which these drivers can build their driving skills. It is not intended that KhanaKids will cover every type of vehicle or driving technique, nor is it intended that it be followed exactly. Instructors should use their skill and knowledge to build, enhance and modify the tasks to suit their students learning needs while considering the learning outcomes of KhanaKids.

## 1.1 Instructors

All instructors shall obtain the appropriate working with children accreditation before undertaking student instruction at an event.

A minimum ratio of two instructors to 3 students is recommended.

Instructors shall at all times provide support to the students attending the course and shall act fairly and equitably to all students while instructing.

Instructors should understand their role as a mentor to students and behave appropriately.

Instructors shall have full discretion on the eligibility of a student to participate in the course and if an instructor has concerns relating to a student or a student's conduct at an event they shall raise the matter with the student and, if the matter is not satisfactorily resolved, they may deem a student to be ineligible to continue the course.

## 1.2 Students

Students should have limited knowledge in relation to vehicles and driving.

Students shall be made aware that their participation is at the full discretion of the instructors and that they are expected to follow instruction as required.

The minimum age of attending students shall be determined by the individual student's ability, however, as a guide students should be between 12 to 16 years of age.

Parents of attending students are encouraged to participate in theory/practical exercises.

Students may undertake all or part of the course and may attend multiple courses as places are available.

Students shall rotate between driving exercises and theory/practical exercises.

Each student shall have no longer than 10 minutes of continuous driving at any one time. This will give the student time to absorb the lessons from the exercise and rest between driving exercises.

Students may undertake multiple driving sessions while working on the same driving exercise.

Students shall be assessed during each exercise and once their instructor is satisfied they have achieved the learning outcome for the exercise shall be progressed through the exercise.

Once students have completed all driving exercises to a satisfactory level they will be presented with a certificate of course completion stating their name, date of completion and the name and signature of an appropriate instructor.

No Student shall enter the course unless specifically instructed by an instructor.

Students should wear comfortable clothing with covered shoes. Helmets are not required.

### 1.3 Vehicles

All vehicles used for driving exercises shall:

- Be in a good roadworthy condition.
- Have a manual gearbox or automatic.
- Be fitted with appropriate ADR approved safety belts as a minimum for both the driver and front Passenger seats.

Small hatch back type vehicles are recommended.

## 1.4 The Course

The course shall be positioned separate from any public roadway or public recreational area unless specific approval from the appropriate authority has been granted prior to the event.

At least one fire extinguisher shall be made available directly at the course boundary and should be clearly marked.

The course shall be a minimum of 30 metres wide and 150 metres long.

Course boundaries shall be clearly marked using tape or other suitable marking material.

The course shall be marked with clear markers at 20 metre intervals directly along the centre starting at 25 metres from the edge of the short side.

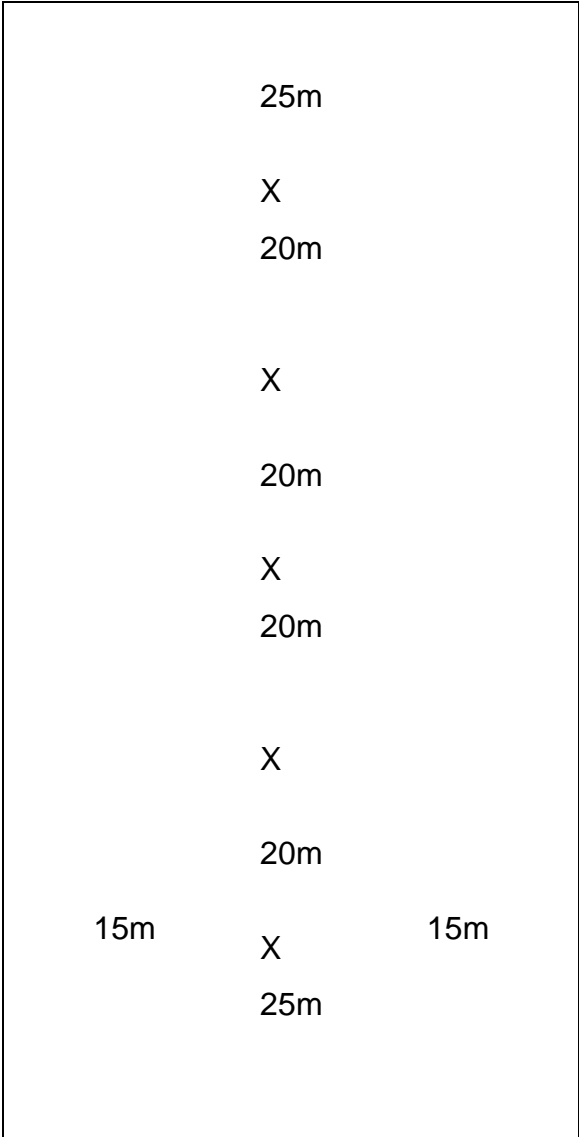
One vehicle shall be permitted on each course at any one time.

The start position shall be directly opposite the first centre marker and can be anywhere between the centre marker and the outside boundary of the course.

More than one course may be used at any training day and courses may be directly next to each other.

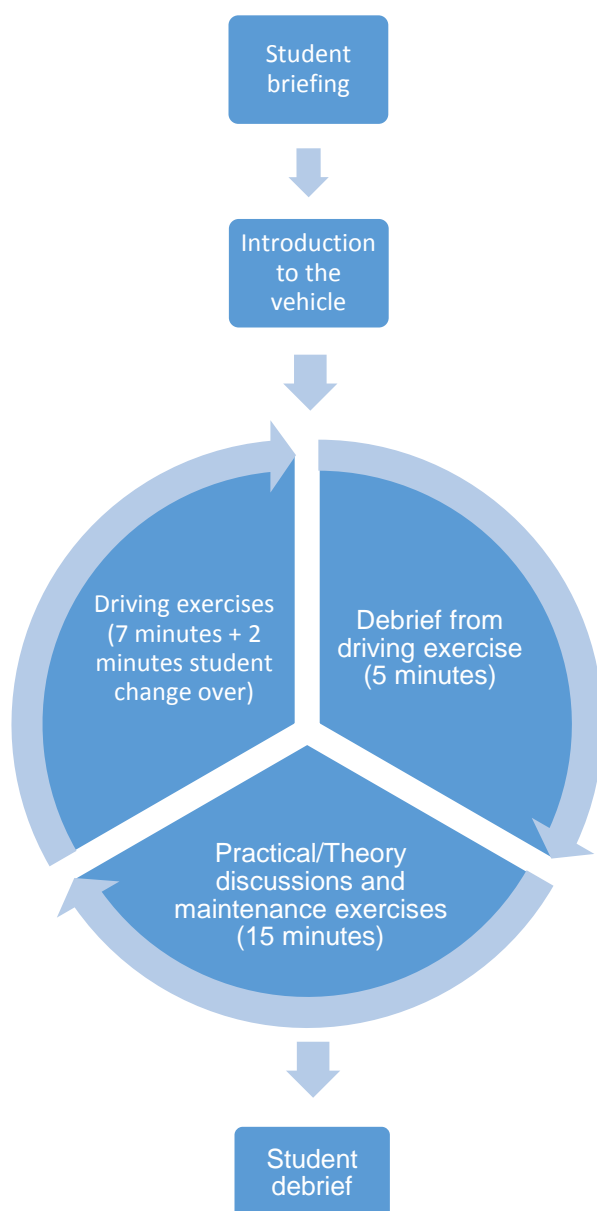
Vehicles shall be driven as instructed and may be driven in any direction and around any centre line markers.

The boundary of the course shall be avoided and students will be instructed as such.





## 1.5 How are training events conducted



### 1.5.1 The Student Briefing

At the start of the event students should be quickly taken through the general housekeeping matters. This briefing must cover:

- An introduction of each of the instructors and other officials for the event and their role.
- Where students should go and what they should do in case of an accident/incident.
- What will be expected from the students and what they will be doing during the event.

- Parent participation.
- How and when to enter and exit from vehicles on the course.
- Any other site specific matters like out of bounds areas, things to be cautious of.

### 1.5.2 Emergency or Incident Procedures

If during an event an incident occurs which requires an immediate response the following actions should be taken:

1. Should an instructor require immediate assistance they should signal distress via sounding the vehicle's horn continuously for a period of five seconds or where radios are used, the main control should be contacted directly.
2. Should an official or instructor see an incident which requires immediate attention they must also contact the main control. Control may then issue a distress signal in order to evacuate the students to the main control area.
3. In the event of a distress signal:
  - a. All other students should proceed to the main control area and wait for further instructions from the course officials.
  - b. The first aid officer shall proceed to the vehicle/instructor from which the alarm was raised taking with them the first aid equipment.
  - c. A second official shall take the fire extinguisher from the main control to the vehicle in distress.
  - d. All other officials shall remain at the main control area for further instructions from the attending officials.
  - e. Further medical assistance may then be sought as necessary.

For all minor incidents (minor cuts etc) and incident report should be filled out as required.

### 1.5.3 Introduction to the Vehicle

At this point students should be split into their groups and instructors should introduce them to the vehicle they will be driving. The introduction should discuss topics from section 3 Vehicle basics focusing on 3.2 Vehicle Controls and also discuss section 4.1 Set your seating position. Once these topic have been covered the students should be split again and the driving exercises and theory/practical exercises should commence.

### 1.5.4 Driving exercises

- Instructors should work through the driving exercises at the students pace. Once the instructor is happy that the student has achieved the learning outcome for the exercise the student should be progressed to the next exercise.
- After each session in the car give the student a few tips on what they did well and what they could improve on.
- Seating position.
- Follow the correct starting and stopping procedures to ensure safety.
- Provide some focus on areas that the student is having trouble with. For example a student may have trouble with down shifting gears, **but** while it is important that the student gains proficiency in many aspects don't solely focus on trouble areas, and remember that no one learnt to drive perfectly in one day.

### 1.5.5 Debrief from driving exercises

Once a student has completed a session in the vehicle as part of the debriefing the theory instructor should ask them a few of the following things:

- How do they think they went?
- Was there anything they had particular trouble with?
- What did they do well?
- What did they like the most about the exercise?
- Do they have any questions?

Based on the students response give them some positive feedback and encouragement and take them through any problems they may have had. Also show them the relevant information that is available in the KhanaKids Student Booklet.

Student feedback is very important, it allows the student to self-reflect and gain some insight into how to improve their skills, it also provides a sense of achievement when they do something well.

A student may feel negative about how they are going and it is very important to always give them encouragement do not focus on what they did wrong focus on what they can improve.

The student feedback will also help the development of the course. Feedback should be noted by instructors in order to improve the course to better target the students' needs.

### 1.5.6 Practical/Theory discussions and Maintenance

After being debriefed the student should be guided through the practical and theory and maintenance exercises. Students should work with each other and their instructor discussing the different topics and undertaking the exercises. Parents may also assist with this part of the course. It is not necessary that the student do all steps of an exercise to achieve the outcome of the task, it is more important that they gain insight into the safety aspects of why maintenance is undertaken a particular way and that they gain some idea of the different concepts relating to the theory.

As an example the theory relating to brakes main points are: Brakes convert mechanical energy to heat so brakes get hot. Brakes use fluid to transfer the force from the pedal to the brake caliper and this fluid needs to be changed in order to maintain effective brakes. When using the brakes, it is important to apply them correctly as this will influence how quickly the vehicle will stop and also how the vehicle will steer. The hand brake functions differently to the foot brake.

### 1.5.7 Student debrief

At the end of the course, students should be brought back together for a final debriefing. Topics discussed maybe:

- What students liked about the course?
- What didn't they like about the course?
- What other driving opportunities are available to the students and where they can find information about these opportunities.
- Any relevant club information relating to upcoming events.

### 1.5.8 Feedback Forms and record keeping

Good record keeping relating to the event is important for a number of reasons. It allows:

- clubs to keep track of students who have undertaken the course.

- It and aids with performance indicators and reporting which is often required for grant funding.
- It helps to plan for future events.
- Clubs to follow up of event details.

Feedback forms are a good way of gathering feedback from each event. An example of a suitable form is available.

## 2 Introduction

The aim of KhanaKids is to give its drivers both practical driving experience and theory about how vehicles work.

KhanaKids has been written for beginner drivers who have little to no experience with driving vehicles however all the principles you will learn form the basis of advanced driving techniques.

The instructors of KhanaKids will work through each of the sections with the drivers. If you have any questions about any of the topics please feel free to ask any of the instructors at your training. Once the instructor is happy that you have achieved the outcomes from each lesson you will move on to the next.

You are not expected to finish all the tasks in this booklet on your first day, it is better that you learn the basics before moving on with more difficult tasks.

Driving a vehicle can be very exiting but it can also be frustrating while you are learning some of the techniques, don't be discouraged if you are having trouble. Talk it through with your instructor, they are here to help you and, most importantly, have fun.

## 3 What is KhanaKids?

KhanaKids is broken in to four sections:

1. Vehicle basics - which is all about the vehicle and how it works and bit about what happens when you use the vehicles controls.
2. Vehicle maintenance - which is all about vehicle maintenance and why it is needed and some guides on what to do to look after a vehicle.
3. Driving techniques - which is all about the actual techniques you will use while driving a vehicle.
4. Driving exercises – these are what you will be doing while learning to drive the vehicle.

## 4 Vehicle basics

### 4.1 What is a vehicle?

*4.1.1.1 Outcomes - Develop a basic understanding of what a vehicle is and its main parts.*

A vehicle is a machine that is used to move something. It may be people, dirt, food or basically anything that needs to be moved from one place to another. In KhanaKids we have used the word vehicle as it covers more than just cars, what we will actually be covering and discussing KhanaKids is the common car that is used in everyday life across the world.

Very simply, a vehicle is made of:

- A chassis which is the frame of the vehicle which all its other parts are attached too.
- An engine which provides the power to make the vehicle move.
- A drive train which carries the power from the engine to the wheels.
- Wheels and tyres which grip the ground and are turned by the power from the engine making to make the vehicle move and change direction.
- And suspension which is attaches the wheels to the chassis and absorbs bumps in the ground.
- Controls used to direct the vehicle where we want it to go and at what speed.

### 4.2 Vehicle Controls

*4.2.1.1 Outcomes - Develop a basic understanding of where the major controls of a vehicle are positioned.*

To drive a vehicle the driver uses the controls. By doing different things to the controls the vehicle is being told what the driver wants to do. Modern cars use computers to help control the vehicle, older vehicles have no computers and the control is done purely by the driver. Vehicles have lots of controls for lots of different tasks, this course will focus on the controls used to drive a manual vehicle.

#### 4.2.2 Pedals

These are located in the driver foot well.

- The right pedal is the accelerator and is controlled with your right foot.
- The centre pedal is the brake and is controlled with your right foot.
- The left pedal is the clutch and is controlled with your left foot (vehicles with an automatic gearbox do not have a clutch pedal).

Each pedals purpose and how to use them will be shown later on in other sections.

### 4.2.3 Steering Wheel

Located directly in front of the driver. This is used to turn the wheels of the vehicle making it change direction when it is moving.

### 4.2.4 Gearstick

This is located in the centre of the vehicle just forward of the seats and often has markings on it to show the different gear positions. The gearstick is used to change the gear that is selected in the gearbox.

### 4.2.5 Handbrake

This is a lever and is usually located in the centre of the vehicle between the seats. This is used to stop the vehicle from moving when not driving.

### 4.2.6 Ignition/Keys

The ignition is usually near the steering wheel and is where the vehicle's key is put into. It is used to start and stop the vehicle.

## 4.3 The Engine

*4.3.1.1 Outcomes - Develop a basic understanding of what an internal combustion engine does and its methods of control.*

### 4.3.2 What is an engine?

Most cars have an internal combustion engine. This type of engine converts fuel and air into usable energy. This energy is in the form of a mechanical turning force. The engine sucks in air from the atmosphere, adds a specific amount of fuel to the air, squashes the air fuel mixture and then lights the mixture. When the mixture burns it quickly expands, it is this expansion of gas that is harnessed by the engine and converted into a turning force. Engine speed is measured in turns (revolutions) Per Minute or RPM. Engines have a range of RPM that can be used and what this is dependent on the specific engine.



## 4.4 The ignition

The vehicles ignition is used to start and stop the engine. It controls power from the battery to the vehicles electrical system. It also commonly has a steering wheel lock to help prevent theft. The ignition has five positions:

1. The first position is the steering lock.
2. The second position disables the steering lock.
3. Third position turns the power on to the vehicles electrical circuits but not the engine.
4. Fourth position turns the engines power circuits on.
5. Fifth position turns the starter motor on (this is only for starting the engine).

When you turn the key to this position you will need to hold it there for a few seconds until the engine starts then let the key go and it will return to the fourth position.

## 4.5 Accelerator

The accelerator is used to control the speed of the engine by changing how much fuel and air is being burnt inside the engine. When you push the accelerator pedal down more air and fuel is burnt inside the engine so more energy is being released, this makes the engine turn faster. When the pedal is raised less fuel and air is burnt and the engine slows down. When an engine is running and the accelerator pedal is raised all the way up it is said to be idling. When driving a vehicle you will notice that the accelerator can make the vehicle go faster when pressed, but the vehicle will also slow down when the pedal is raised. This is because the engine only wants to turn enough for the amount of fuel and air it is burning. This effect can be used to slow the vehicle down especially when changing down gears. You will notice that when in low gears the effect the accelerator has on the vehicle speeding up or slowing down is a lot greater.

## The Gearbox

*4.5.1.1 Outcomes - Develop a basic understanding of the gearbox, gear ratios and their relationship to the engine.*

### 4.5.2 What is a gearbox?

The gearbox has two sides, and input side which is connected to the engine and an output side which is eventually connected to the wheels. The gears inside the gearbox allow the ratio between the engine and the wheels to be changed. The gearstick is used to control which gear is selected in the gearbox. In low gears like first and second the engine is turning a lot more in relation to how much the wheels of the car are turning. By doing this more torque or turning power is given to the wheels. When there is lots of torque at the wheels of a car it make it easy for the engine to make the vehicle go faster. In high gears like fourth and fifth the engine turns a lot less in relation to the wheels. This allows the car to go faster but with less torque being transferred to the wheels it makes it harder for the engine to speed up the vehicle.

When a vehicle is stationary it is very hard to get it to move as it requires a lot of torque, so we use low gears to get the vehicle moving. Once a vehicle is moving we use higher gears to make it go faster.

Automatic gearboxes work like a manual gearbox only they change up and down gears without the driver needing to move the gearstick.

## 4.6 The clutch

*4.6.1.1 Outcomes – Develop a basic understanding of the clutch and its purpose.*

A clutch is used to connect the engine to the gearbox. This connection is made of plates that press together. The clutch is controlled by the clutch pedal. One plate is connected to the part of the engine which turns and the other plate is connected to the gearbox. When the clutch pedal is pushed down the surfaces of the plates move apart reducing the friction and allowing the engine to spin more that the gearbox. When the clutch pedal is raised the plates press hard together and the gearbox will turn the same amount as the engine.

The clutch allows the driver to control with the clutch pedal when the power from the engine is allowed to travel through the gearbox to the wheels.

Vehicles with an automatic gearbox do not have a clutch, instead they use a torque converter. When the accelerator is pressed and the engine rpm rises the torque converter automatically starts to turn the gearbox.

## 4.7 Brakes

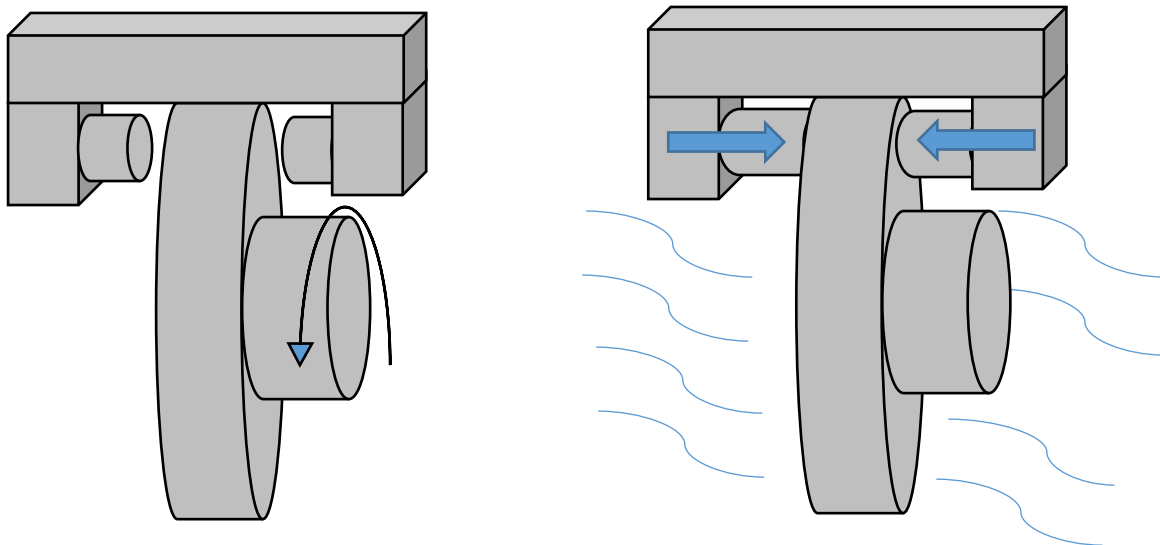
4.7.1.1 *Outcomes - Develop a basic understanding of how brakes work and the difference between the handbrake and the foot brake.*

4.7.1.2 *Develop an understanding of how brakes should be used effectively.*

### 4.7.2 The Brakes

Vehicles usually have two types of brakes: the hand brake which is usually only attached to the rear wheels of the vehicle and the foot brake which is attached to all four wheel brake mechanisms. The hand brake uses cables to control the brakes and the foot brake uses a hydraulic system.

Hydraulic systems use liquid and pipes to transfer the force applied to the brake pedal to the brake mechanisms at each wheel. Hydraulics can work a little bit like gears and are used to turn a little bit of force pushing on the brake pedal into a lot of force at the brake mechanism. Attached to each wheel is a rotor or hub. The force applied to the pedal is used to create friction on the rotor or hub and this friction turns the rotational energy of the wheel into heat energy. This transfer of energy is what makes the brakes slow the vehicle and it also makes the brakes get very hot.



Because hydraulic systems have a tendency to loose pressure over long periods of handbrakes are usually mechanical and not hydraulic.

Handbrakes often have their own pads and mechanisms which are separate to the foot brake systems but the systems are not designed to handle lots of use or heat but are intended to keep the vehicle from moving once it has stopped.

### 4.7.3 Braking

When driving you use your right foot to press the brake pedal. When you are using the foot brake the harder the pedal is pushed the more friction is applied by the brake mechanism. The pedal may be pressed gently to ease the vehicle to a stop or very hard to stop the vehicle more quickly. If you press the pedal too hard the tyres will lose grip and the wheels will lock causing the car to skid and slide. This should be avoided as when a car is sliding it is much more difficult to control and stopping takes longer.

When you begin to use the brakes you should press your foot down gradually and slowly increase the pressure. By applying the brakes gradually the weight of the chassis is transferred to the front wheels and pushes down giving more grip. You will be able to feel this movement in the vehicle. The more grip you have the harder you will be able to brake and you will also stop quicker.

If you quickly push down on the pedal the vehicle does not have time to shift its weight and the car will not have as much grip to use for braking and stopping will not be as fast.

If you do start loose grip while braking and the wheels skid simply release the brake slightly and start to reapply pressure.

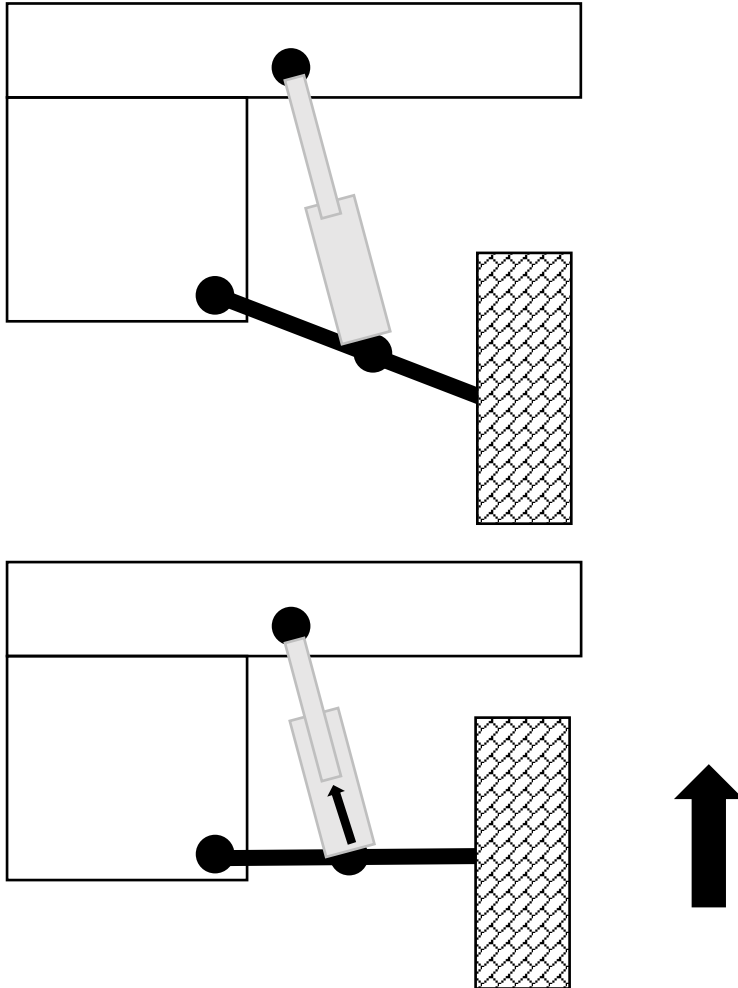
## 4.8 Suspension

*4.8.1.1 Outcomes - Develop a basic understanding of vehicle suspension systems and their purpose, and how suspension behaviour can impact the vehicles handling*

### 4.8.2 What is suspension and what does it do?

The suspension of a vehicle is used to absorb the impact of bumps in the road surface. The suspension of a vehicle connects the wheels and tyres to the chassis. Without suspension riding and driving a vehicle would feel very rough. Suspension is made up of a spring and a damper. The spring holds the weight of the chassis and also provides resistance to the force of the bump. The damper stops the spring from suddenly bouncing back to its original position. Without a damper a car would bounce up and down on the springs. Suspension allows the wheels of the car to move up and down separately to the chassis of the vehicle. The absorption effect is caused by the energy

needed to squash the spring is less than what is needed to lift the entire weight of the vehicle. If the car hits a big bump very hard it may run out of movement. When this happens the remaining energy is transferred to the chassis, because the chassis is very stiff it cannot flex or spring to absorb the energy, if there is too much energy from the bump for the suspension to absorb it can break or bend the vehicle's chassis.



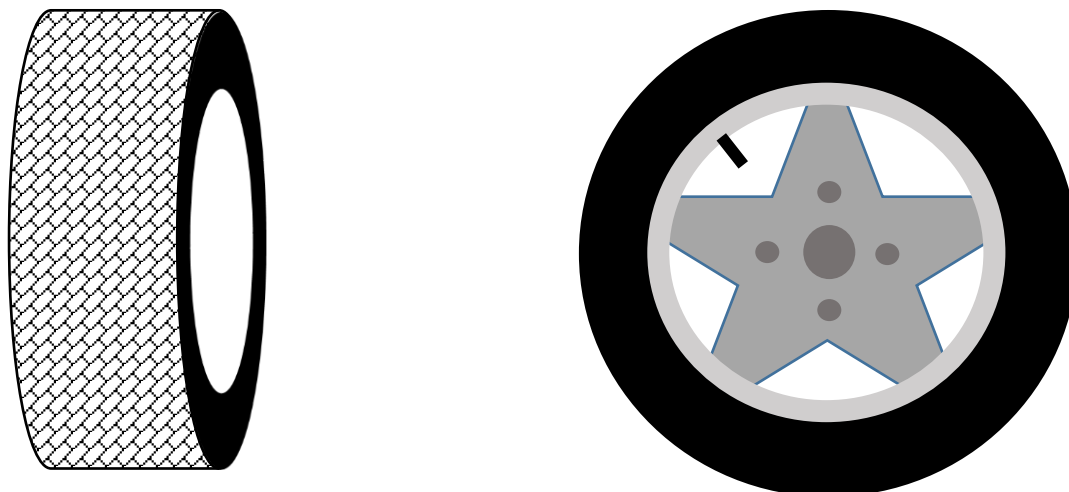
Because of the movement of the chassis on its suspension a vehicle will behave differently when accelerating or braking or turning. When accelerating a vehicle will lift the weight off the front wheels, when braking it will put more weight on the front wheels and when turning it will put more weight on the outside wheels. When this happens the amount of grip that the wheels have on the road is changed, more weight gives a vehicle more grip and less weight takes grip away.

## 4.9 Wheels and Tyres

*4.9.1.1 Outcomes - Develop a basic understanding of the parts of a wheel and tyre and how tyre pressure and wear can impact a vehicle's safety.*

Wheels and Tyres are made up of four parts:

- The Wheel which is attached to the vehicle by bolts to the rotor or hub.
- The Tyre Carcass which is the rubber part. The Carcass has tread that grips the ground and a wall which gives the tyre height and flex.
- The valve which is used like a tap to get air or gas into and out of the tyre.
- The air or gas which is used to fill the tyre.



The height and flex of a tyre allows the tyre to act a bit like suspension absorbing bumps in the road, it also allows the tyre to bend to the shape of the ground giving it more grip.

There are many different things that can affect a tyre's grip. They can be made from hard or soft rubber, have different tread patterns widths and different side wall heights. There are two main things that change how well a tyre can grip the ground are how worn they are (how much tread is left on the tyre) and their air pressure (how much air is squashed into the tyre).

#### 4.9.2 Tyre Tread

Tyres wear out, as you drive a vehicle little pieces of the rubber are left on the road. Eventually the tread on the tyre begins to wear down until no tread is left.

Tread performs a very important task for tyres. Tread allows the tyre to move water away from where the tyre touches the ground. If water gets stuck between the tyre and the ground the vehicle will lose grip and slide on top the water. This is called a hydroplane, when this happens there is no way to control the vehicle. This is why it is important to ensure tyre are replaces when they are worn.

### 4.9.3 Tyre Pressure

Tyre pressure can change how a tyre will behave. A tyre's air pressure is a measurement of how much the air is squashed inside the tyre, the more air that is squashed in the more pressure there is. Low tyre pressure will make a tyre very bouncy and also cause the car to roll more when cornering. Too much pressure and the tyre becomes very hard and you will feel more of the bumps in the road. Wheels and tyres transfer the rotational force from the engine and gearbox to the ground. They need to grip the ground but still be able to roll over the ground easily. The recommended tyre pressure for vehicles is usually in the vehicle's manual or on the inside of the driver's side door pillar. Usually tyre pressures should be between 28 PSI to 35 PSI.

### 4.10 Additional information

There are lots of resources available on the internet where you can find out more. The following links are two very good youtube channels which provide simple yet accurate information.

#### 4.10.1 For more about how vehicles work see:

<https://www.youtube.com/user/EngineeringExplained>

#### 4.10.2 For good information about maintaining and servicing vehicles see:

<https://www.youtube.com/user/HumbleMechanic>

#### 4.10.3 For technical information about vehicle aerodynamics and about advanced driving techniques see:

<https://www.youtube.com/user/kyle.drives>

## 4.11 Vehicle Maintenance

*4.11.1.1 Outcomes - Develop a basic understanding of what types of maintenance are required for vehicles.*

Vehicle maintenance is important because it ensures that the different parts of the vehicle will do their job. Often maintenance might be just checking a fluid level or that a part is clean.

Vehicles use different fluids for their systems. These fluids do very particular jobs. Brake fluid is made to be squashed a lot and not boil at high temperatures. Engine oil is made to help parts slide across each other.

These fluids change over time and with use and eventually they do not work as well as they did when they were first put in the vehicle. This is why fluids in vehicles need to be changed. If they are not things like the brakes will not work as well as they could or parts will wear out.

Engines often use belts to turn parts. If these belts are not tight they can slip meaning that those parts are not turning as fast as they should be. One example of the use of belts in an engine is the alternator. This part of the engine charges the vehicles battery. If the belt is not tight and is slipping the alternator will not charge the battery and eventually the vehicle will not run because it needs the electricity from the battery to power the electrical circuits of the engine.

Engine oil is another fluid that must be changed regularly. If an engine runs out of oil or has old oil that does not do its job parts of the engine that rub together will start to get very hot and eventually they will seize or basically get so hot that the two parts stick together. When this happens it is very expensive to repair.

Coolant is used in the radiator. Coolant is a liquid that does not freeze easily. If water is used in a radiator it can freeze and damage the engine and radiator. Coolant is pumped through the engine and radiator. The radiator transfers the heat from the coolant to the air. If there is not enough coolant taking heat away from the engine it can overheat and damage the engine.

## 4.12 How to change a tyre

If you have the vehicles manual you should always read it before changing a tyre because it will show you where to put the jack and other safety advice which may be for that vehicle. The following is a guide to changing a tyre.



1. If possible move the vehicle to a flat area out of the way of traffic.
2. Ensure that the vehicle is in first gear and the hand brake is on.
3. If you can place some chocks at the front and back of a tyre that is not being changed. You can use a piece of wood or a rock, something that would be difficult for the vehicle to roll over. This will help prevent the vehicle from falling off the jack.
4. Loosen each of the wheel nuts  $\frac{1}{2}$  turn on the wheel being changed.
5. Place the jack under the vehicle in one of the jacking spots next to the wheel being changed. There are usually spots in front or behind the wheels that have two cut outs which the jack goes between.
6. Raise the vehicle slowly using the jack until it the tyre is just off the ground.
7. Remove the wheel nuts and the wheel.
8. Place the spare wheel onto the hub or rotor and put on the wheel nuts.  
Tighten each nut a little at a time and evenly. Give them a quick tighten.
9. Lower the vehicle so that the tyre is touching the ground.
10. Tighten the wheel nuts properly in a cross pattern.
11. Lower the vehicle fully to the ground and remove the jack.
12. Check the wheel nuts are tight again.
13. Remove the chocks.

#### 4.13 How to check tyre pressure

1. Remove the valve cap
2. Place the tyre pressure gauge firmly onto the valve.
3. Read the pressure measurement from the gauge. If the tyre pressure is low the tyre will need to have more air put in (to do this you will need an air compressor or an air pump, most service stations have these). If the tyre pressure is very low, do not drive the vehicle as this can cause damage to the wheel and also the vehicle will be very difficult to drive and control.

#### 4.14 How to check engine fluid levels

##### 4.14.1 Brake fluid

**Warning: Brake fluid is often a corrosive substance. You should be very careful when handling brake fluid and if you spill any make sure that you wash it off immediately with water. Do not get it on the vehicles paint.**

The brake fluid reservoir (or container) is usually found at the back of the engine bay near the brake pedal. It has a minimum and a maximum level. You can check it by

making sure the fluid in the container is between the minimum and maximum lines. If it is low the top of the container will usually unscrew or have a clip to hold it on. Simply take the cap off and top up the fluid to the correct level. Do not over fill the container. There are a few different types of brake fluid, make sure you are using the correct one for the vehicle. **Never use old brake fluid.**

#### 4.14.2 Coolant

If the vehicle has an over flow tank for the radiator then check the level is between the minimum and maximum levels on the side. If it is low top up as needed.

If the vehicle only has a radiator:

1. Very carefully check that the radiator is cool to touch. If it is hot do not undo the radiator cap. When coolant is hot in the radiator and engine it is under pressure, removing the cap will make lots of hot coolant erupt from the radiator and could burn you severely.
2. If it is cool you may remove the cap and check that the radiator has coolant to just below the cap. If it is low top up as needed.

#### 4.14.3 Engine oil

1. Locate the engine's dip stick.
2. Pull out the dipstick and wipe off the oil.
3. Put the dipstick back in to the engine all the way and pull it out again. On the base of the dipstick are level indicator lines, make sure the oil level is between the lines. If it is low top it up.

Note: Be very careful topping up engine oil, too much oil is bad for the engine. Normally the filler cap for the engine is on it top and is usually marked "OIL". When filling make sure you have the correct type of oil (this will be in the vehicles manual). Only put in small amounts of oil at a time (about 250ml at a time) and give the oil time to run down into the sump of the engine. After you have added a small amount, check the level again using the dipstick. Repeat until the oil level is between the minimum and maximum levels.

## 5 Driving techniques

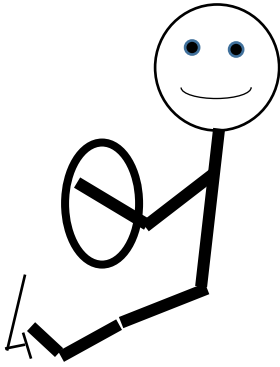
The following section is about what to actually do when driving a vehicle. You will use these techniques when you are doing the driving exercises.

### 5.1 Set your seating position

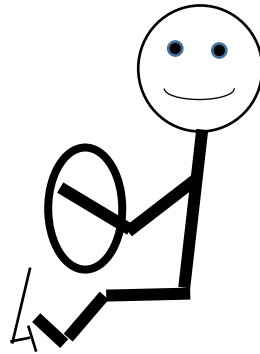
*5.1.1.1 Outcomes – Develop and understanding of how to be correctly seated in a vehicle and why this position is important.*

Modern vehicles often have many ways that the seat, steering wheel and sometimes pedals can be adjusted. When you are learning to drive a vehicle take some time to learn the different ways to adjust the seat etc. The basics of adjusting your seating position are below.

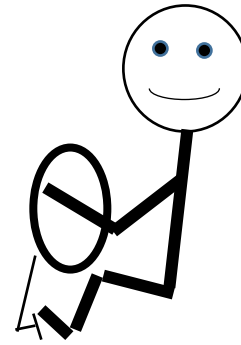
1. Sit in the car.
2. Press the clutch pedal all the way down, you should have a slight bend in your knee when the pedal is fully depressed.
  - If you're your leg is straight move the seat forward slightly.
  - If your leg is bent a lot, move the seat back slightly.
3. Repeat this step until you have the correct knee position.
4. Now place your hands on the steering wheel.
5. Your arms should be bent at the elbows and you should not be stretching to reach the wheel.
6. If you are stretching or your arms are straight, move the seat back forwards a little
7. If you are too close and your arms fell squashed when holding the wheel move the seat back backward a little.
8. Once you are comfortable with your position then you can put on the seat belt.



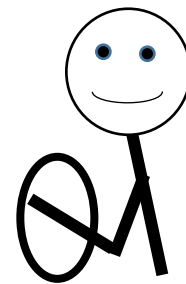
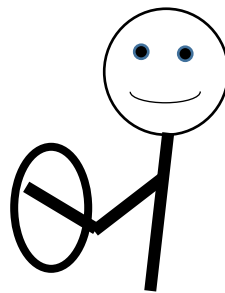
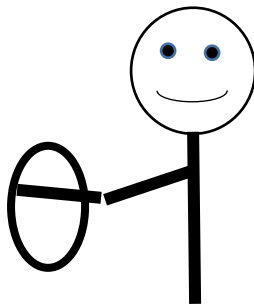
Too far away



Good



Too close



### 5.1.2 Why is the seating position important?

The correct seating position will allow you to maintain control of a vehicle and reduce the effort needed to control the vehicle. The correct seating position is also important because if you have a major accident while driving your arms and legs are in a position where they will move if needed, if they were in a straight position it is more likely that you could break an arm or leg because they are less likely to move.

## 5.2 Start and stop a vehicles engine

*5.2.1.1 Outcomes - Develop an understanding of the process of starting a car and why following this process is important.*

The process for starting most vehicles is:

1. Check the hand brake is on.
2. Push the clutch pedal all the way in.
3. Select neutral (for vehicles with an automatic gearbox ensure that park is selected).
4. Turn the ignition to the on position.
5. Turn the ignition to the start position and hold until the engine starts.
6. Once the engine has started release the key from the start position.

### 5.2.2 Why is the starting procedure important?

Checking the hand brake is on first will ensure that the vehicle will not move when the clutch is depressed.

By pushing the clutch pedal down the input shaft of the gearbox will not be turned when the engine is started, this helps the starter motor turn the engine more easily.

By making sure the vehicle is in neutral there is less chance the vehicle will move when starting.

## 5.3 Stopping a vehicles engine

The process for stopping most vehicles is:

1. If the vehicle is not stopped then slow the vehicle as described in the stopping procedure.
2. Ensure the vehicle has come to a complete stop.
3. Keep the clutch pedal pressed in (for vehicles with an automatic gearbox ensure that the foot brake is pressed).
4. Apply the hand brake.
5. Turn the ignition back to the third position (the engine will stop running).
6. Select first gear (for vehicles with an automatic gearbox ensure that park is selected).
7. Raise the clutch pedal.

### 5.3.1 Why is the stopping procedure important?

Checking the hand brake is on first will make sure that the vehicle will not move when the clutch is pushed in.

By selecting first gear when the vehicle is stopped it will make sure the vehicle won't roll off because it is very hard for the wheels to turn the engine in first gear.

## 5.4 Steering

*5.4.1.1 Outcomes - Develop a basic understanding of the process of steering a vehicle.*

Once the vehicle is moving you can change where it will go by steering with the steering wheel. When you need to turn around a corner simply start to turn the wheel gently in the direction you want the vehicle to go. Once you have turned the vehicle to the direction you wish to travel you need to return the steering wheel back to the centre position. The amount you need to turn the wheel depends on two things, how tight the turn is and how fast the vehicle is traveling. Steering a vehicle takes practice and is different for every vehicle. The steering wheel can usually be turned in either direction between about 1 to 2 turns. Usually when you are driving at higher speeds you turn the wheel less than when you are driving slowly. It is important not to turn the steering wheel too quickly because this can result in a loss of grip.

## 5.5 Manual Vehicles

### 5.6 Move off (Manual Vehicles)

*5.6.1.1 Outcomes – Develop skills in learning how to get a vehicle to move off.*

1. Start the vehicle
2. Select first gear
3. Press the accelerator pedal slightly and bring the engine rpm up a little.
4. Slowly raise the clutch pedal until you can feel the clutch friction point.
5. Release the hand brake.
6. Once the vehicle is moving continue to raise the clutch pedal until it is all the way up.
7. Once the pedal is up the vehicle speed is controlled using the accelerator pedal.

Note: The clutch friction point is usually a very small part of the pedal movement usually about 3 cm of the pedal. Once you are familiar with where this is in a vehicle you can quickly raise the pedal to this point and then slowly ease the pedal up from this point.

## 5.7 Stop (Manual Vehicles)

5.7.1.1 *Outcomes – Develop skills in learning how to get a vehicle come to a stop safely.*

1. Raise the accelerator pedal all the way.
2. Press the clutch pedal all the way in.
3. Move your right foot to the brake pedal.
4. Gently push down on the brake pedal until the vehicle has stopped.
5. Once the vehicle has stopped apply the hand brake.
6. Select neutral.
7. Raise the clutch.

Note: You can use this procedure at any time and in any gear.

## 5.8 Change up gears (Manual Vehicles)

5.8.1.1 *Outcomes – Develop skills in learning how to get a vehicle to accelerate through gears.*

Once you have the vehicle moving:

1. Slowly press the accelerator to speed up the vehicle
2. The speed at which you change gears at is usually done by feel, you need to be carrying enough speed so that when you change into the next gear the engine is in the bottom end of its rev range.
3. Press the clutch all the way in.
4. Select the next gear up (the gear pattern is usually on the gear knob).
5. Slowly release the clutch and begin to press the accelerator.

## 5.9 Change down gears (Manual Vehicles)

5.9.1.1 *Outcomes – Develop skills in learning how to get a vehicle to decelerate through gears.*

Once you have the vehicle moving at speed in 2<sup>nd</sup> or a higher gear:

1. Slowly lift the accelerator pedal and apply the brakes to slow down the vehicle.
2. The speed at which you change down gears at is usually done by feel, you need to slow down enough so that when you change into the next gear the engine is nearer to the top end of its rev range.
3. Press the clutch all the way in.
4. Select the next gear down (the gear pattern is usually on the gear knob).
5. Slowly release the clutch and begin to press the accelerator.

## 5.10 Automatic Vehicles

### 5.11 Move off (Automatic Vehicles)

*5.11.1.1 Outcomes – Develop skills in learning how to get a vehicle to move off.*

1. Start the vehicle.
2. Press the foot brake.
3. Select the Drive gear.
4. Release the hand brake.
5. Slowly release the foot brake and shift your right foot to the accelerator pedal.
6. Press the accelerator pedal slightly and bring the engine rpm up a little, the vehicle will slowly begin to move.
7. The vehicle speed is now controlled using the accelerator pedal.

Note: Automatic vehicles have a friction point just like a manual vehicle but it is controlled using the accelerator and brake together. Once you are familiar with where this is in a vehicle you can quickly push the accelerator to this point and then slowly ease the pedal up from this point.

### 5.12 Stop (Automatic Vehicles)

*5.12.1.1 Outcomes – Develop skills in learning how to get a vehicle come to a stop safely.*

1. Raise the accelerator pedal all the way.
2. Press the clutch pedal all the way in.
3. Move your right foot to the brake pedal.
4. Gently push down on the brake pedal until the vehicle has stopped.
5. Once the vehicle has stopped apply the hand brake.
6. Select neutral.
7. Raise the clutch.

Note: You can use this procedure at any time and in any gear.

### 5.13 Changing gears in an automatic vehicle

*5.13.1.1 Outcomes – Develop skills in learning how to get a vehicle to accelerate through gears.*

When using the Drive gear in a modern automatic vehicle a computer selects the best gear for what the engine is doing. When you are moving off if you push hard on the accelerator it will rev the engine through its RPM range and then automatically change up a gear. When you are cruising at a medium speed in a high gear and accelerate hard the gearbox will change down a gear and make the vehicle accelerate faster.



When you are slowing down using the brake the vehicle will change down gears to match the engine and vehicle speed. Because the computer is controlling the gear changes automatic vehicles do not require as much control from the driver as a manual.

Automatic gearboxes have the option of selecting gears similar to a manual gearbox. When you select the gear the gearbox will not change automatically.

## 6 Driving Tasks

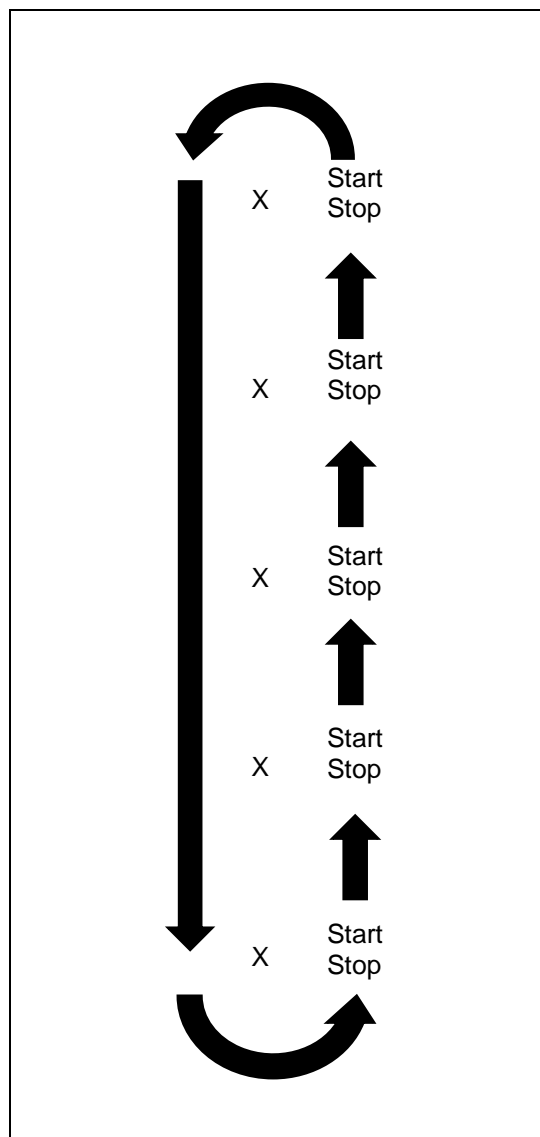
**Driving exercise 1** – Learn to Start the vehicle, move off and stop focusing on the clutch friction point.

*6.1.1.1 Outcomes – The driver will get use to finding the clutch friction point and then stopping using the clutch.*

Description - Start at the first marker and then stop at the next. This is done for half the track and then the vehicle is driven around the end marker and back to the starting position (This will allow the driver to rest their leg briefly).

Notes

- Speed to be kept to minimum
- Use first gear only, no gear changes
- May use some foot braking, use of the hand brake.
- Some turns

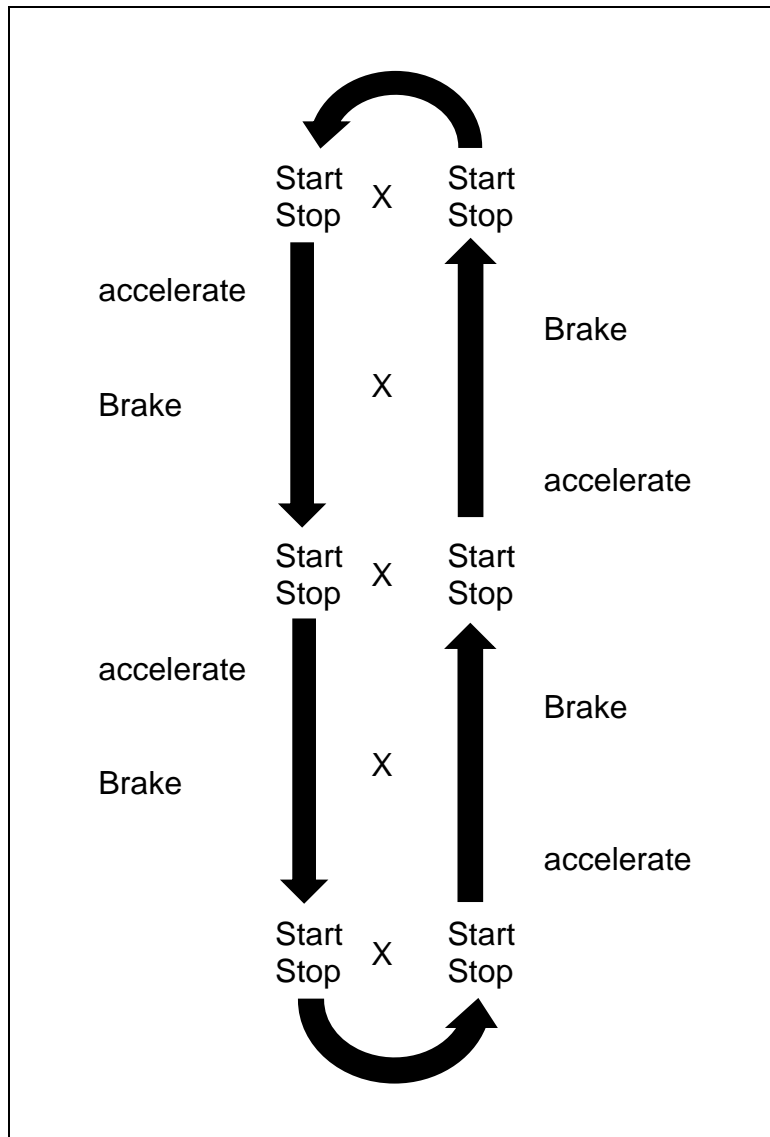


## Driving exercise 2 – Learn to start the vehicle, move off and stop the vehicle using the foot brake focusing on the clutch friction point.

Description – Move off from the start point accelerate to the next marker and then slow the vehicle to a stop using the foot brake stopping at the next marker. Repeat.

### Notes

- Use first gear only, no gear changes
- Use the foot brake with soft pressure
- Some turns



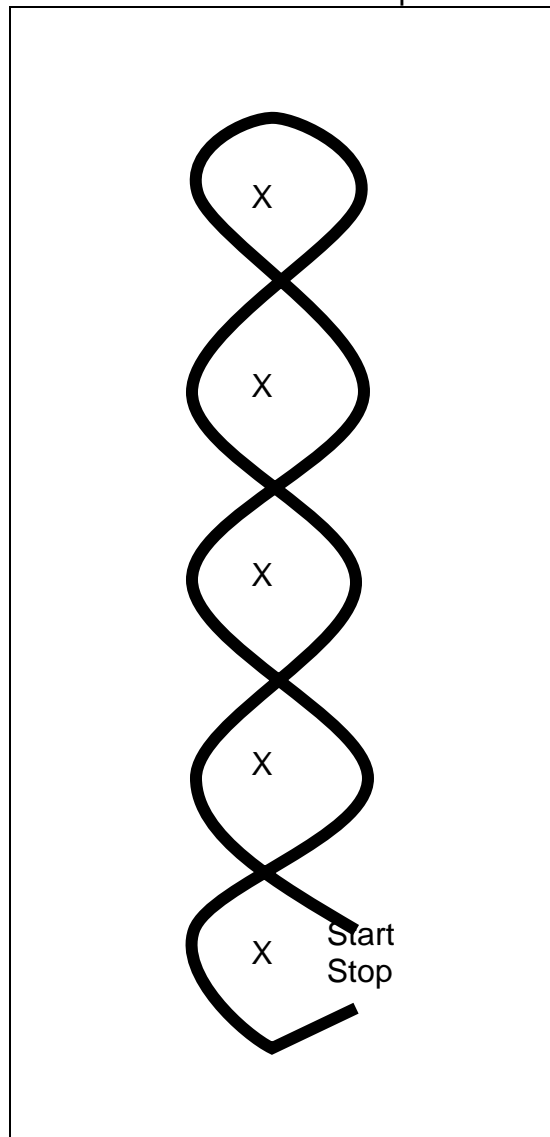
**Driving exercise 3** – Learn to steer a vehicle after starting and move off focusing on direction changes and vehicle awareness.

6.1.1.2 *Outcomes* – The driver will get use to turning a vehicle through corners and changing direction in the next corner becoming mindful of the vehicle's size.

Description - This task involves starting at the first marker weaving between the markers making a hairpin turn at each end.

Notes

- Speed to be kept to minimum.
- Use first gear only, no gear changes (for automatic vehicles select first gear)
- May use some foot braking, use of the hand brake.
- Be mindful of the size of the vehicle.
- Use the accelerator to control the vehicles speed.



## Driving exercise 4 – Learn to change up and down gears focusing on accelerator and brake control.

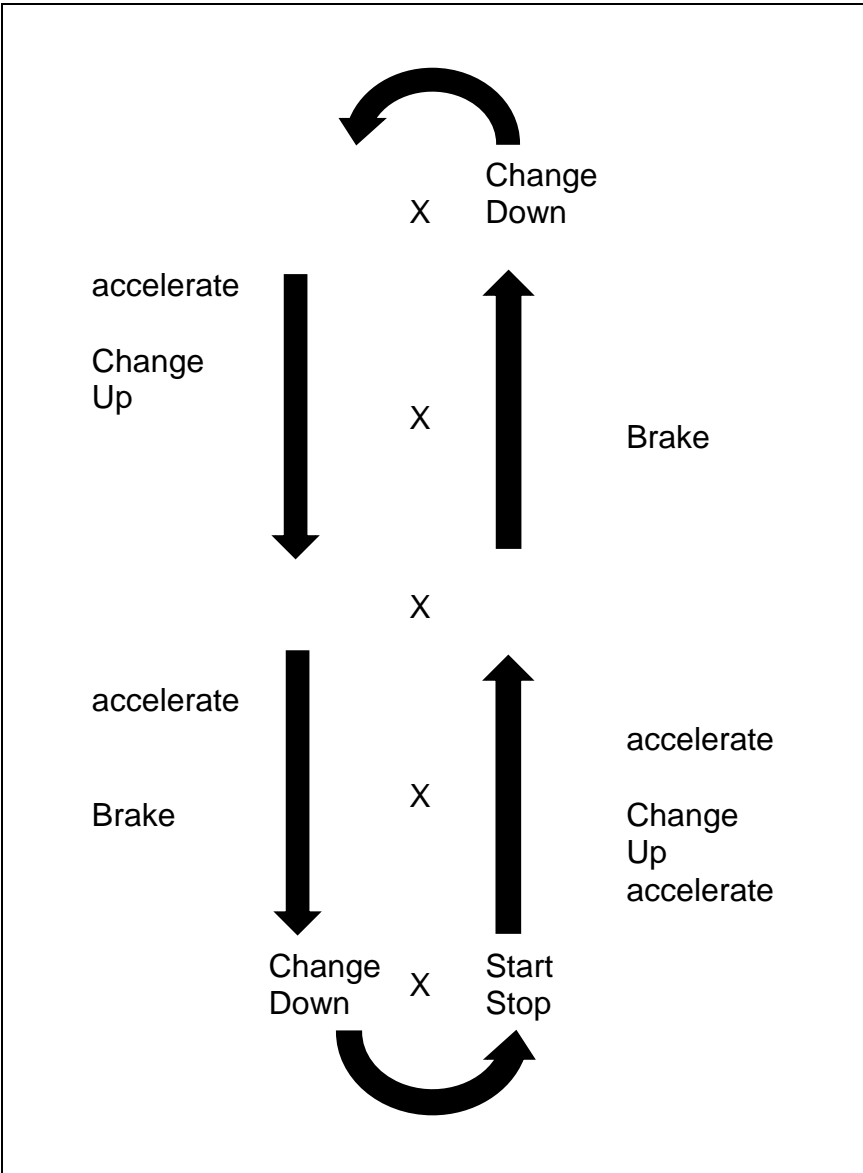
6.1.1.3 *Outcomes – The driver will get use to developing vehicle momentum and finding the speed at which to change up and down gears.*

### Description:

1. Starting at the first marker.
2. Move off and accelerate.
3. Change up a gear at/or before the second marker.
4. Accelerate to the third marker.
5. After the third marker begin braking.
6. Change down a gear after the forth marker.
7. Round the end marker.
8. Repeat back to the start position.

### Notes

- Speed to be kept slow/moderate.
- Use first and second gear with frequent changes (for automatic vehicles select drive gear).
- Foot braking required, use of the hand brake.
- Concentrate on getting momentum when changing up gears and braking to change down.
- Changing down to first gear is the most difficult down change because of the gear ratio, in most vehicles you will need to be going very slowly.



## Driving exercise 5 – Learn to corner at medium speeds focusing on speed control with the accelerator.

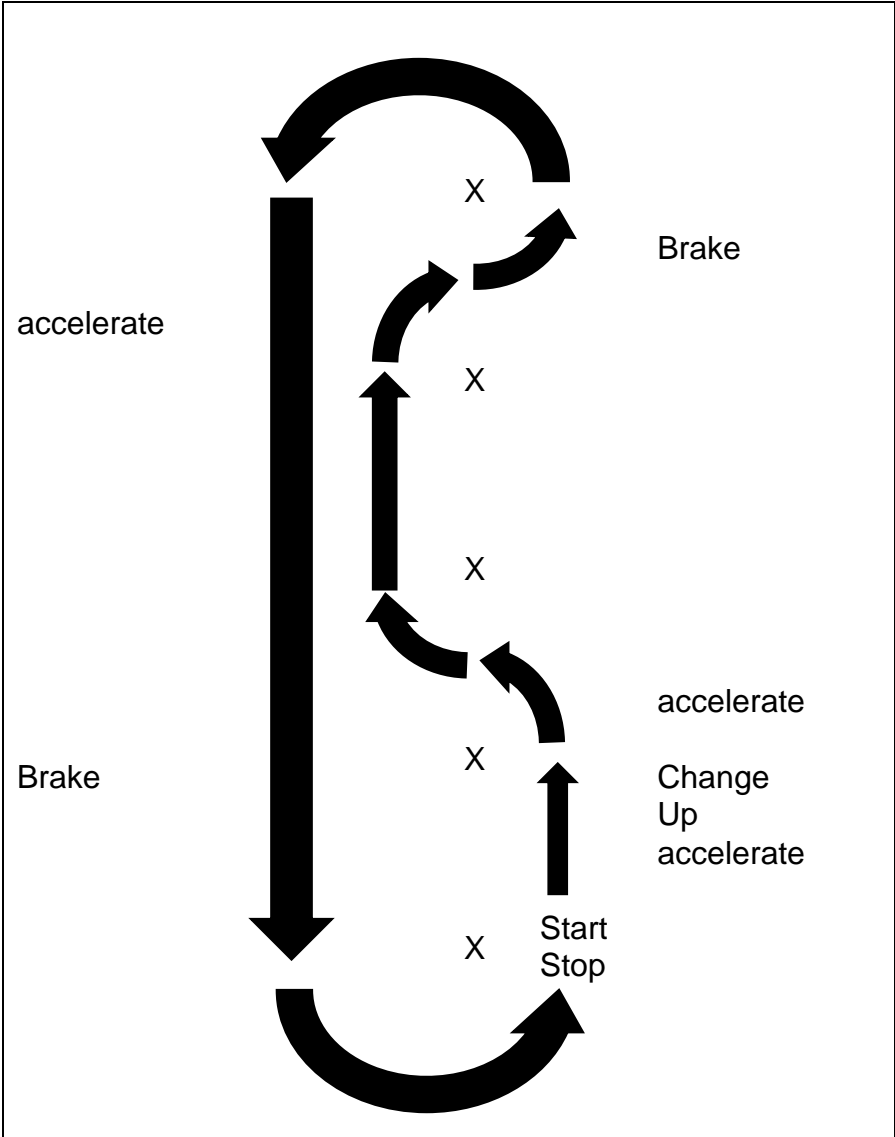
6.1.1.4 *Outcomes – The driver will get use to controlling the vehicle's speed while cornering.*

Description:

1. Starting at the first marker.
2. Move off and accelerate.
3. Change up a gear at/or before the second marker.
4. Turn after the second marker.
5. Turn after the fourth marker and slow.
6. Round the end marker.
7. Accelerate and brake returning to the start position.

Notes

- Speed to be kept slow/moderate.
- Use first and second gear with minimal changes (for automatic vehicles select drive gear).
- Foot braking may be required.
- Concentrate on getting momentum when changing up gears and using the accelerator to control the vehicle's speed.





## 7 Quick Guide

Seating position	<ul style="list-style-type: none"> <li>• Clutch in</li> <li>• Leg slightly bent</li> <li>• Reach the wheel with arms slightly bent</li> </ul>
Start engine	<ul style="list-style-type: none"> <li>• Hand brake on</li> <li>• Clutch in (Manuals)</li> <li>• Foot on brake (autos)</li> <li>• Gearbox in neutral (Manuals)</li> <li>• Gearbox in park (Autos)</li> <li>• Turn ignition key and start engine</li> </ul>
Stop engine	<ul style="list-style-type: none"> <li>• Vehicle stopped</li> <li>• Hand brake on</li> <li>• Clutch in (Manuals)</li> <li>• Foot on brake (Autos)</li> <li>• Gearbox in 1st gear (Manuals)</li> <li>• Gearbox in park (Autos)</li> <li>• Turn ignition key and stop engine</li> <li>• Clutch out</li> </ul>
Move off (Manuals)	<ul style="list-style-type: none"> <li>• Start vehicle</li> <li>• Clutch in</li> <li>• Select first gear</li> <li>• Little bit of accelerator</li> <li>• Clutch up slowly to friction point</li> <li>• Release hand brake</li> <li>• Clutch out</li> </ul>
Stop (Manuals)	<ul style="list-style-type: none"> <li>• Off accelerator</li> <li>• Clutch in</li> <li>• On brake</li> <li>• Once stopped, handbrake on</li> <li>• Select neutral</li> <li>• Stop engine as above</li> </ul>
Changing up gears (Manuals)	<ul style="list-style-type: none"> <li>• Once moving</li> <li>• Clutch in</li> <li>• Select next gear</li> <li>• Clutch out slowly</li> <li>• Accelerator on</li> </ul>
Changing down gears (Manuals)	<ul style="list-style-type: none"> <li>• Once moving in second gear or higher</li> <li>• Off accelerator</li> <li>• On brake</li> <li>• Clutch in</li> <li>• Select next gear down</li> <li>• Clutch out slowly</li> </ul>
Move off (autos)	<ul style="list-style-type: none"> <li>• Start vehicle</li> <li>• Foot on brake</li> <li>• Select drive gear</li> <li>• Handbrake off</li> <li>• Off brake</li> <li>• On accelerator</li> </ul>
Stop (Autos)	<ul style="list-style-type: none"> <li>• Off accelerator</li> <li>• On brake</li> <li>• Once stopped, handbrake on</li> <li>• Select Park</li> <li>• Stop engine as above</li> </ul>

## 8 Completed Tasks

### 8.1 Vehicle Maintenance Exercises

Exercise	Date	Instructor	Instructor Signature
Set your seating position			
How to change a tyre			
Check tyre pressure			
Car Maintenance			

### 8.2 Completed Driving Exercises

Exercise	Date	Instructor	Instructor Signature
Driving exercise 1			
Driving exercise 2			
Driving exercise 3			
Driving exercise 4			
Driving exercise 5			