LEARNING AREA: TECHNOLOGY

LESSON PLAN	CONTENT IN CONTEXT	GRADE 7
TERM _____	**STRUCTURES** Demonstrates knowledge and understanding of structures in terms of: specific properties of materials stability strengthening and joining techniques	**DURATION** **8 – 11 weeks**

Statement of the problem

A big beverage company, promoting PROUDLY SOUTH AFRICAN, needs an improved advertisement for their product, keeping the 2010 soccer in mind.

According to them the problem with their adverts is that, they are very static and they need to have movement associated with their products .They need you to develop an animated product, which will appeal to all societies and taking environmental factors, bias and cultural diversity into consideration. This animated advertisement will be used in shop windows and or on billboards not bigger than 150 mm length 750 mm height. At least 2 different mechanisms must be used.

Selected LO's and AS's	Teaching and Learning Activities	Details of Assessment Forms, Methods and Tools	
LO 1: Technological processes and skills **AS 1: Investigates** **AS 2: Design** **AS 3: Makes** **AS 4: Evaluates** **AS 5: Communicates** **LO 2: Knowledge and understanding** **AS 3: Mechanical** **LO 3: Technology, Society and Environment** **AS 1: Indigenous Technology and Culture** **AS 2: Impact of Technology**	**Introduction** Teacher explains the concept mechanical systems and what machines are. He discusses how mechanisms make machines work using system diagrams. Teacher show examples of system diagrams and discusses how simple machines work using input, process and output. The teacher also explains how m*echanisms* help us to **change one type of force into another** and that *mechanisms* changes forces, but they also **change one type of motion into another.**	**Form** **Method** **Tool**	Baseline assesment Educator /Peer Questions and answers (Memo)
	Activity 1: Teacher introduces cams and their functions by showing a picture to the class and asks the learners to study the picture and answer the questions based on it. The teacher explains the important feature of mechanisms and refer to the cam as a mechanical component that is fixed to an axle or shaft. It has a special shape and it always turns in a circular motion.	**Form** **Method** **Tool**	Assignment Educator Questions & answers Rubric
	Activity 2: The teacher demonstrates and illustrates that a cam always has a **follower** which moves up and down as it follows the shape of the cam. The **circular motion** of the cam thus changes into a **linear motion** (moving in a straight line) Learners collect resources to build a model of windscreen wipers using a crank and slider mechanism and explain the different motions produce by each mechanism and illustrate the system diagram of each mechanism.	**Form** **Method** **Tool**	Make and Investigation Educator Questions & answers Rubric

Selected LO's and AS's	Teaching and Learning Activities	Details of Assessment Forms, Methods and Tools	
	Activity 3: Teacher explains the concept of levers and how this mechanism helps to make our work easier. The different types of levers (classes) are explained in detail and learners are provided with diagrams to illustrate the different classes of levers. The positions of the load, effort and fulcrum as well as the symbolic representations are clearly illustrated in the form of diagrams and pictures. Learners are provided with a work sheet with examples of different classes of levers used in everyday mechanism and tools. The learners name the tool/mechanism, describe the load and represent it symbolically as shown in the table. Each lever must be classified into a class type.	**Form** **Method** **Tool**	Assignment Educator Work sheet and Rubric
	Activity 4: The learners are provided with pictures that illustrate the life styles of two different families in South-Africa and ask to answer the questions based on it.	**Form** **Method** **Tool**	Case Study Educator Questions and answers
	Activity 4: Project Design and make an animated product, which will appeal to all societies and taking environmental factors, bias and cultural diversity into consideration. This animated advertisement will be used in shop windows and or on billboards not bigger than 150 mm length 750 mm height. At least 2 different mechanisms must be used. Specifications: The product must: • must have moving parts • use two different mechanisms • advertise the product • be proudly South African • focused on 2010 soccer • be 105 mm x 750 mm • be environmental friendly • be non-bias • appeal to all societies	**Form** **Method** **Tool**	Project Educator Questions and answers
Resources: waste material e.g. wood, wire, plastic etc. simple mechanisms e.g. eggbeaters etc. corrugated cardboard, wooden dowels, scissors, glue etc			
Barriers to learning: Example: access to all the necessary resources; learners background knowledge; etc.			
Expanded opportunities and reflections: Refer to Teacher's Guide For The Development of Learning Programmes, page 45.			

SYSTEMS AND CONTROL
(Mechanical Systems)
Grade 7

REPORT CARD

Surname and Name: **Grade:** _____

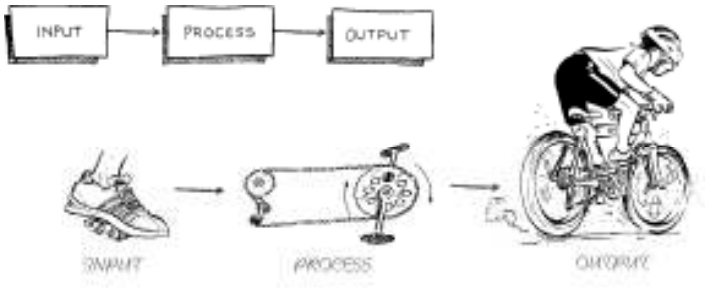
	Form of assessment	Activities	Maximum marks	Mark achieved
1.	Assignment	Activity 1 (Cams and their functions)		
2.	Research / investigation	Activity 2 (Cranks and slider mechanisms)		
3.	Assignment	Activity 3 (Levers and different classes of levers)		
4.	Case Study	Activity 4 (Mechanisms and their effect on people's life styles)		
5.	Project	Activity 5 (problem statement and design brief)		
		(design proposal and specifications)		
		(Initial idea generation)		
		(Development and planning)		
		(Making and evaluating)		
		TOTAL:		
		PERCENTAGE :		
		LEVEL:		

SYSTEMS AND CONTROL
Mechanical Systems

Mechanisms create movement:

All machines, however basic or complex, are made of simple **mechanisms**. A mechanism has a lot to do with movement. It is a device which changes an input motion and force, into a desired output motion and force.

In grade 6 we have learned how simple machines used mechanisms to move and how mechanisms change a specific input into a specific output by using a specific process, e.g. the use of a bicycle:



When you are riding, you press *down* on the pedal (**input**), the chain passes your forces along the chain to the back wheel (**process**), and the bicycle goes forward (**output**)

Mechanisms also help us to **change one type of force into another.** *Mechanisms* changes forces, but they also **change one type of motion into another,** e.g.

Mechanism	Type of input motion	Type of output motion
	**Rotary motion:** To open or close a tap, one has to turn the handle	**Linear motion:** downwards; the rubber valve moves up (to open – water flows) and down (to close – water stops flowing

Systems diagrams are graphic representations of what machines do, showing the various stages, which are interlinked to make up the whole. Let's look at an example of a system diagram of a washing machine.

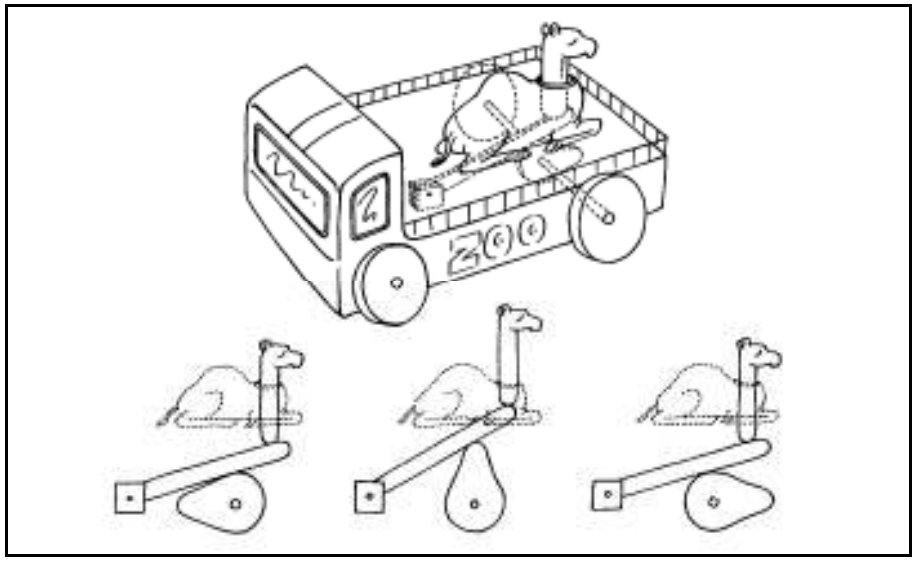
At the **input** stage, a kind of movement, either by a person or a computer or timing switch, is observed. The energy which is used the washing machine is also called the **input**. Without the energy input, no movement of the mechanical parts will take place.

The **process** is the transfer of energy which results in something moving or happening. This is when you see the mechanical parts doing their thing.

The result of this energy input is called **output** which in this case is clean clothes coming out of the washing machine.

WHEELS WITH DIFFERENT SHAPES

Activity 1: Assignment (informal) – Watching wheels work

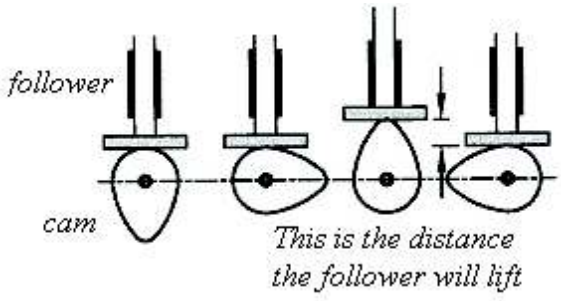


Look at the pictures above and discuss the answers to the following questions:

a. How many wheels does the toy truck have?
b. Describe and draw the shapes of the wheels. How does the shapes of the wheels differ?
c. Identify the axle and hole of each of the wheels. Are all the wheels fixed in the same position? Does the axle go through the centre of the wheel?
d. What do you think will happen when the wheels turn?
e. How do you think the camel's head moves up and down? Where does the movement takes place?
f. Identify which parts move.

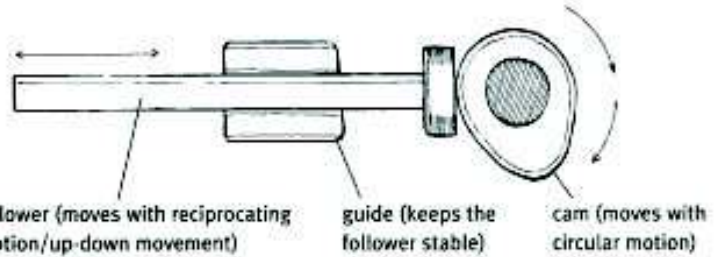
Special kinds of wheels

We think of wheels being round, but sometimes they are made in special ways to do specific jobs. An example of such a wheel is a **cam**. The wheel that makes the camel move up and down in the toy is a **cam**.



A **cam** is a mechanical component that is fixed to an axle or shaft. It has a special shape and it **always turns in a circular motion**.

A cam always has a **follower** which moves up and down as it follows the shape of the cam. The **circular motion** of the cam is changed into a **linear motion** (moving in a straight line)



This is an important feature of mechanisms.

Mechanisms can change the direction of movement

INPUT	PROCESS	OUTPUT
The cam turns in a clockwise direction	The follower follows the shape of the cam	The follower moves up and down (reciprocating motion

How an engine works:

Old and new cars have **pistons** and **cams** in their engines.

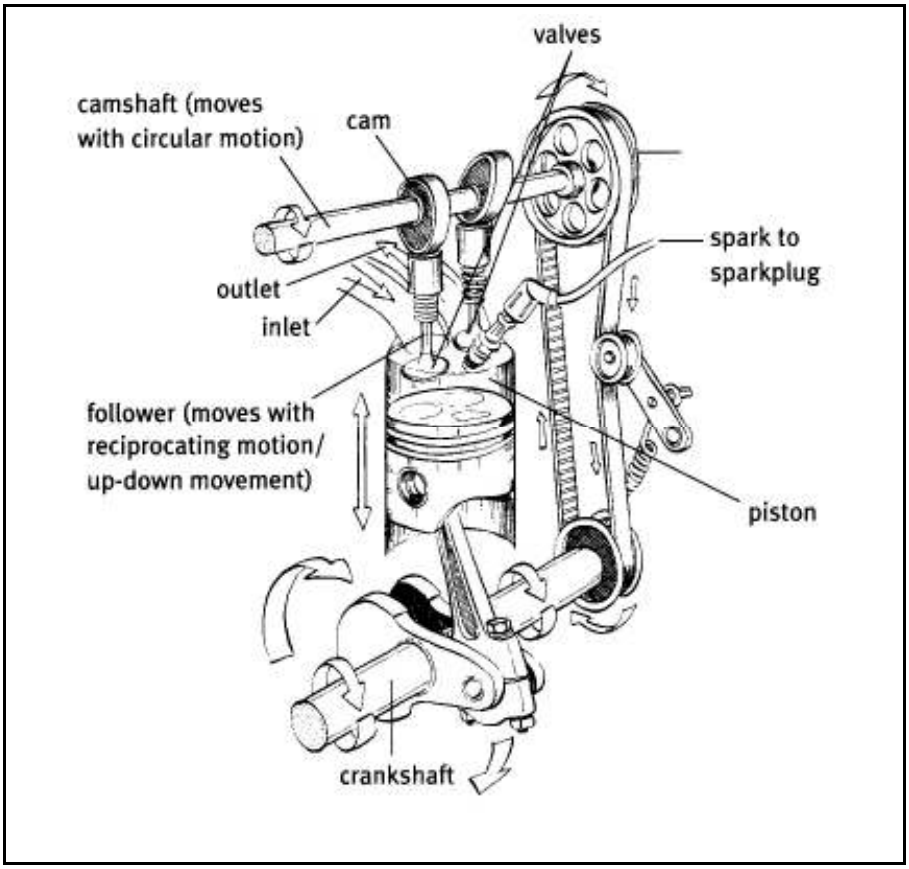
As the **cams** in an engine turn, the **followers** move up and down. This action opens and closes the **valves** leading into the **piston**. There are two valves: the **inlet valve** and the **outlet valve.**

*1. The valve opens: a spark makes the petrol and air mixture **explode** in the cylinder*

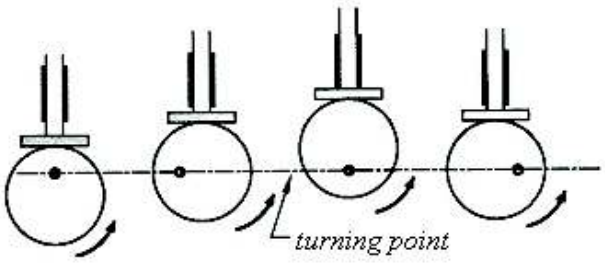
2. The explosion forces the piston to move down. This makes the crank shaft turn.

3. The crank shaft provides the force that makes the wheels turn

4. the fumes then leave the outlet valve an go to the exhaust pipe



A **cam** can also be an **off-centre** wheel. The hole for an axle on which the wheek turns is not in the centre. This causes a special turning movement that makes other parts in the mechanism move in a special way.



*The word **eccentric** means away from the centre. So an eccentric wheel is a wheel with an axle that is not in the centre. As soon as we use an eccentric wheel with a follower, we call it an **eccentric cam.***

Windscreen wiper mechanisms

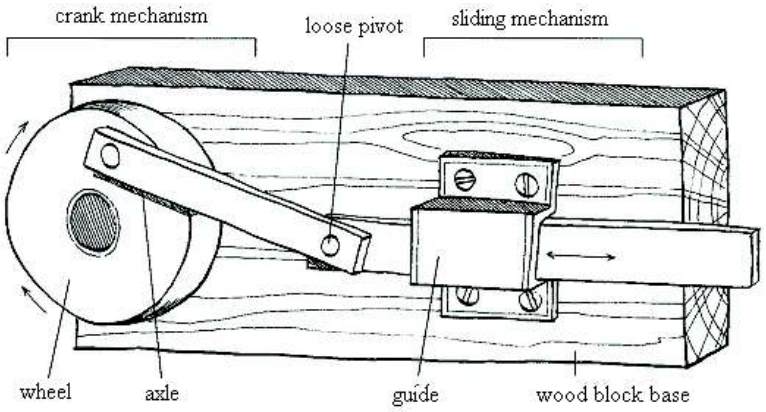
Have you ever looked at the wipers moving across the windscreen and asked yourself: "How did they do that?"
The best way for you to find out is to make it yourself.

Activity 2: (Make and investigate) Make windscreen wipers

(Work in groups) You will need

- *corrugated cardboard*
- *cutting knives/scissors*
- *paper fasteners (these can be used for fixed and loose pivots)*

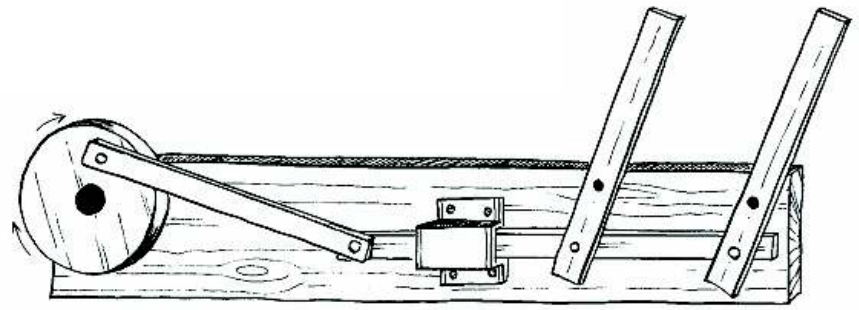
Make this crank and slide mechanism using the materials. Turn the mechanism clockwise.



1. Describe the motion in the crank mechanism
2. Describe the motion in the sliding mechanism
3. Copy and complete the systems diagram below:

INPUT	→	PROCESS	→	OUTPUT

Use the same mechanism to complete the windscreen wiper mechanism:



Note:

- ○ = loose pivot
- • = fixed pivot

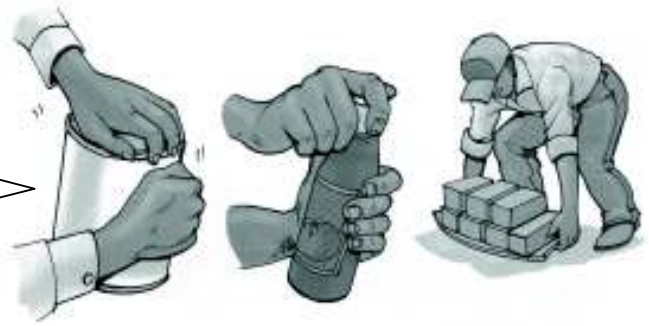
(Fixed pivots are attached to the base)

1. The **input** of the crank is a circular clockwise motion. Now describe the **output** (wipers).
2. copy and complete the systems diagram for the wiper mechanism of a motor vehicle.

INPUT	→	PROCESS	→	OUTPUT
The wiper motor activates the crank mechanism in a clockwise direction.				

LEVERS

How can these people make their work easier to do?



*By using **levers**! The screw driver, bottle opener and trolley are all examples of **levers**.*

Levers were probably the first *mechanism* to be used by humans – long before the wheel was invented. People in the Stone Age used the **lever principle** to move heavy stones, as in the cartoon.

A long firm object like a stick or pole *pivots* on a smaller stone. The pivot is known as the **fulcrum** and the big stone as the **load**, while someone has to put in the **effort** to move the stone.

Today this type of lever has been modified into many things, like crowbars and bottle openers.

The door handle of your class room, the scissors you use and a fishing rod are all levers. Three things can be identified when a lever is used:

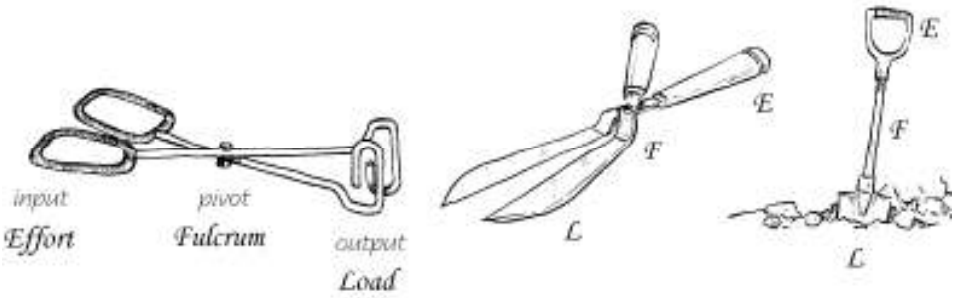
- An effort *(the push or the pull)* – the input force
- A fulcrum *(the point around which the load and the effort turn or rotate)* – the pivot
- The load *(the thing that resists the pushing or the pulling)* – the output

Let's look once again at our first three examples of levers. Can you identify the input (or effort), fulcrum and the load? Make use of arrows to indicate those three things.

Levers can be divided into **three classes**. The position of the fulcrum, load and effort are different in each of the classes of levers.

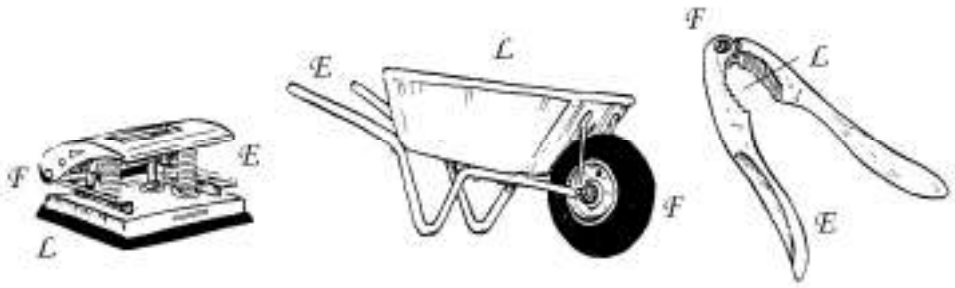
Class one levers:

In class one levers, the fulcrum *(pivot)* is between the effort and the load.



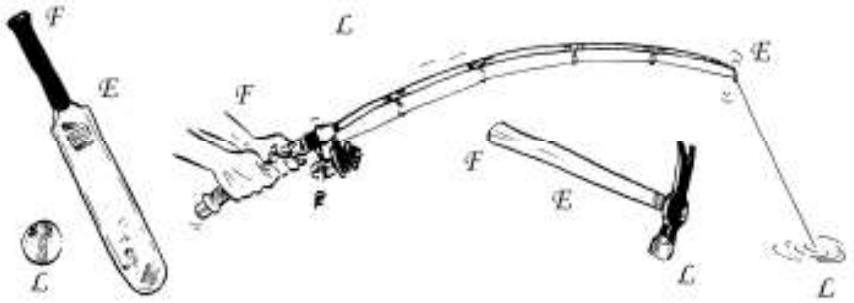
Class two levers:

In class two levers, the load is between the effort and the fulcrum *(pivot)*, with the fulcrum on the outside.

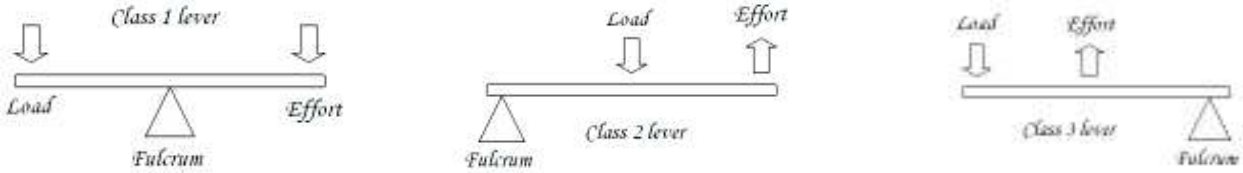


Class three levers:

In class three levers, the effort *(input)* is between the load and the fulcrum *(fulcrum)*.

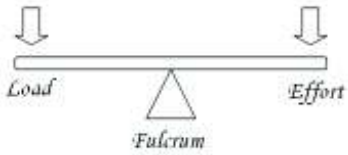
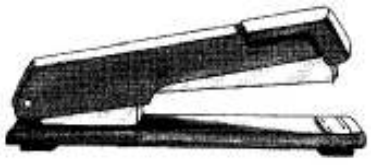


Symbolic representation



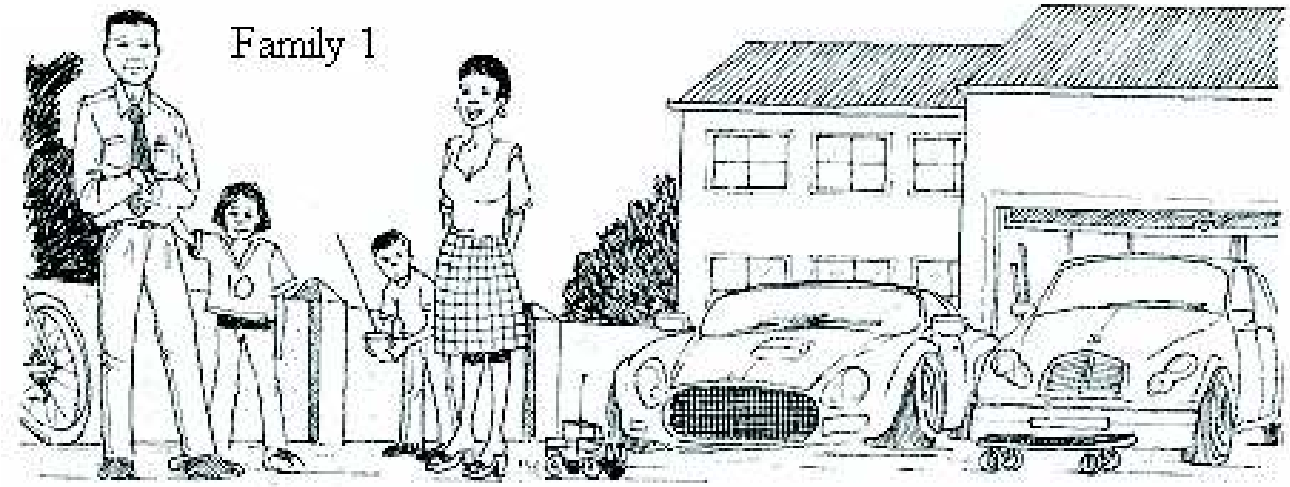
Activity 3: Summative Assessment:

Below are examples of different classes of levers used in everyday mechanism and tools. Name the tool/mechanism, describe the load and represent it symbolically as shown in the table. Each lever must be classified into a class type.

	Garden shears cutting a branch. The branch is the load	 *Class 1 lever*
		
		
		
		
		

Activity 4: (group discussion) Case Study – Informal assessment

Compare these two South African families:



1. Here is a list of some mechanisms:
   wheels and axles; pulleys; gears; cranks; cams; levers

   List examples of products using mechanisms outside the home of each family in the picture. Write down the mechanism these products use.

2. Choose two products from Family 1 and say how they affect the quality of lives.

3. Read this quote from a newspaper article: *"All South Africans are equal because all of us can afford any technological products."*

   Do you agree with the quote? Are certain families disadvantaged or favoured by technological products?

   Use the example of Family 2 to help you answer this question.