**Faculty of Technology – Summative Assessment**

**Subject: Year 7/8 Resistant materials (Mr May)**

If you studied **Resistant materials** during lockdown, you will be assessed on the following topics when you return to college in September.

**Topics to be Assessed:**

1. What is a mechanism?
2. Types of motion.
3. Cams and followers.
4. Levers and linkages.
5. Pulleys.

**Resources to Help You:**

What is a mechanism?

Mechanisms are devices that have been designed to make jobs easier. They all have certain things in common:

* They involve some kind of [motion](https://www.focuselearning.co.uk/programmes/?programme=mechanical-toys-webgl&page=motion/rotary.html)
* They involve some kind of [force](https://www.focuselearning.co.uk/programmes/?programme=mechanical-toys-webgl&page=tecvocab.html)
* They must have some kind of input to make them work
* They produce some kind of output

If we connect mechanisms together we can build mechanical systems called machines.

Mechanisms can also be used to make moving toys like the [caterpillar](https://www.focuselearning.co.uk/programmes/?programme=mechanical-toys-webgl&page=caterpillar.html) and the other toys featured in this program

**Types of motion**

# Linear motion

Linear motion is movement in a straight line. An example of linear motion is the cutting arm of a [paper guillotine](https://www.focuselearning.co.uk/programmes/mechanical-toys-webgl/assets/images/la_guillotine.jpg) as it travels from one side of the machine to the other.

# Oscillating motion

Oscillating motion is movement backwards and forwards in a circular arc. E.g. playground swings (photo) and clock pendulums.

# Reciprocating motion

Reciprocating motion is a backwards and forwards movement in a straight line. Sewing machine [needles](https://www.focuselearning.co.uk/programmes/mechanical-toys-webgl/assets/images/la_reciprocate2.jpg) work with this type of motion.

# Rotary motion

When something moves in a circle it is called rotary motion.

# Cams and followers

A cam is a specially shaped piece of wood, metal or hard wearing plastic, which is usually fixed to a rotating [shaft](https://www.focuselearning.co.uk/programmes/mechanical-toys-webgl/assets/images/la_shaft.jpg).

A follower is held against the cam, either by its own weight or by a spring. As the cam turns ([rotary motion](https://www.focuselearning.co.uk/programmes/?programme=mechanical-toys-webgl&page=motion/rotary.html)) the follower moves up and down ([reciprocating motion](https://www.focuselearning.co.uk/programmes/?programme=mechanical-toys-webgl&page=motion/reciprocate.html)).

The distance and speed at which the follower moves depends on the [shape of the cam.](https://www.focuselearning.co.uk/programmes/?programme=mechanical-toys-webgl&page=cams/camgraph.html)

## Circular cam

A circular cam is also known as an 'eccentric' cam. The centre of rotation of the cam is offset from the centre of the circle.

## Pear shaped cam

A pear shaped cam has a long dwell period during which time the follower does not move. This is ideal for the '[Sailing Ship](https://www.focuselearning.co.uk/programmes/?programme=mechanical-toys-webgl&page=ship.html)' model where various parts move in sequence as the crank is turned.

## Triangular cam

Followers working with triangular cams do not have a dwell period like other cams. This means they move continuously as the cam turns. Triangular cams are found in mechanisms that use clapping movements, e.g. [Perky Porky](https://www.focuselearning.co.uk/programmes/?programme=mechanical-toys-webgl&page=perky-porky.html).

# Follower motion

The distance that a follower moves when a cam turns through one complete rotation is called the [stroke.](https://www.focuselearning.co.uk/programmes/mechanical-toys-webgl/assets/images/zzstroke.jpg) The stroke is determined by the cam shape and the cam [offset](https://www.focuselearning.co.uk/programmes/mechanical-toys-webgl/assets/images/zzoffset.jpg).

# Levers

Levers make it possible to open things and move heavy weights using a small amount of effort. E.g. opening a can of paint with a screwdriver.



A lever is a rigid rod pivoted about a fixed axis called a [fulcrum](https://www.focuselearning.co.uk/programmes/mechanical-toys-webgl/assets/images/la_class1_lever.jpg).  Levers are used to change the direction of motion of a [force](https://www.focuselearning.co.uk/programmes/?programme=mechanical-toys-webgl&page=tecvocab.html), and to make it [bigger](https://www.focuselearning.co.uk/programmes/mechanical-toys-webgl/assets/images/la_lever_movement2.jpg) (magnify) or smaller (diminish).

Levers are also used to [link](https://www.focuselearning.co.uk/programmes/?programme=mechanical-toys-webgl&page=paralink.html) together parts mechanisms.

Examples of levers: [wheelbarrow](https://www.focuselearning.co.uk/programmes/mechanical-toys-webgl/assets/images/la_wheelbarrow.jpg), [nutcracker](https://www.focuselearning.co.uk/programmes/mechanical-toys-webgl/assets/images/la_nutcrackers.jpg), [scissors](https://www.focuselearning.co.uk/programmes/mechanical-toys-webgl/assets/images/la_scissors.jpg), [claw hammer](https://www.focuselearning.co.uk/programmes/mechanical-toys-webgl/assets/images/sm_hammer.jpg), [tweezers](https://www.focuselearning.co.uk/programmes/mechanical-toys-webgl/assets/images/la_tweezers.jpg), [shovel](https://www.focuselearning.co.uk/programmes/mechanical-toys-webgl/assets/images/sm_class3_lever.jpg), [sack trolley](https://www.focuselearning.co.uk/programmes/mechanical-toys-webgl/assets/images/sm_class2_lever.jpg).

# Linkages

Mechanical linkages are made up of a series of [levers](https://www.focuselearning.co.uk/programmes/?programme=mechanical-toys-webgl&page=levers.html) which are connected together.



Linkages can change the direction of a movement, alter the size of a force or make things move in a particular way.

Parallel motion linkages are used to make two or more parts of a mechanism move together and stay parallel to each other as the linkage moves.

Reverse motion linkages are used to change the direction of motion. A single lever with a pivot at its centre reverses an input motion without affecting the input force.

Bell crank linkages are useful for changing the direction of motion or transmitting it round a corner. E.g. [Bicycle brakes](https://www.focuselearning.co.uk/programmes/mechanical-toys-webgl/assets/images/la_bell_crank.jpg).

# Pulley systems

One method of transmitting [rotary motion](https://www.focuselearning.co.uk/programmes/?programme=mechanical-toys-webgl&page=motion/rotary.html) from one shaft to another is by using pulley wheels and belts.



By altering the size ([diameter](https://www.focuselearning.co.uk/programmes/mechanical-toys-webgl/assets/images/la_diameter.jpg)) of the pulley wheels it is possible to change the speed of rotation of the [output shaft](https://www.focuselearning.co.uk/programmes/mechanical-toys-webgl/assets/images/la_pulley2.jpg).

To achieve a large speed reduction or increase, it is sometimes necessary to combine more than [two pulleys in a system](https://www.focuselearning.co.uk/programmes/%26width%3D400%26height%3D278%26bordered%3Dno%26loop%3D1%26mp4%3Dmechanical-toys-webgl/assets/video/kissing_couple_pulley.mp4). This removes the need to have very big pulleys as this can cause problems where space is limited.

**Online resources.**

* [https://www.focuselearning.co.uk/](https://www.focuselearning.co.uk/u/2501/pdidcenmFxsldrzczajroihcFcthsoebr)
* <http://www.technologystudent.com/>

You will need to answer Qs such as those on the focus website.