

Unit R101 – Engineering principles

Mechanical principles

Instructions and answers for teachers

These instructions should accompany the OCR resource ‘Mechanical principles’ activity which supports OCR Cambridge Nationals in Engineering.

OCR Engineering Level 1/2 Cambridge NATIONALS

Unit R101 - Engineering Principles

Mechanical Principles

Task 1

Machines or mechanisms make a difficult or heavy job easier to do. This might be a very simple tool, lever or machine that has fixed and moving parts that can be connected to take the input motion and force to produce a different output motion or force.

Complete the table below with an explanation of what each of the terms means and think of an example of where this is used.

Term	Explanation	Application or example where this could be used
Load		
Effort		

The Activity:

This resource comprises of 2 tasks.



This activity offers an opportunity for English skills development.



This activity offers an opportunity for maths skills development.

Associated materials:

‘Mechanical Principles’ activity sheet

The tasks are best completed in pairs or three learners.

For Task 2 learners will need access to some basic workshop or classroom resources such as rulers and other supplies that learners can use as a simple pivot, and small items that learners can use as a load.

Suggested timings:

Task 1: 10 minutes

Task 2: 30–45 minutes

Task 1

Machines or mechanisms make a difficult or heavy job easier to do. This might be a very simple tool, lever or machine that has fixed and moving parts that can be connected to take the input motion and force to produce a different output motion or force.

Complete the table below with an explanation of what each of the terms means and think of an example of where this is used.

Term	Explanation	Application or example where this could be used
Load	The item, weight or mass that is being held, supported or moved by the mechanism.	A weight such as a car on a jack, a pallet on a lift truck, sand in a wheel barrow.
Effort	The force that is applied to move the load.	Pushing down a lever, lifting a lever, pulling on a spanner.
Fulcrum	This is the pivot for the lever. The position of the fulcrum, load and effort determines the class of lever.	Centre or pivot such as a centre of a wheel, pivot of a pair of scissors or pliers.
Mechanical Advantage	This means that the mechanism used will allow you to move a large output load with a smaller effort, such as using a lever, pulley or gear.	Use a pulley to lift a heavy or large item. Use a gear to use a smaller turning effort into a larger effort. Lever of a sheet metal folding machine.
Class 1 Levers	The load and the effort are at opposite ends or sides to the fulcrum.	Seesaw, claw-end of a hammer.

Term	Explanation	Application or example where this could be used
Class 2 Levers	The load is between the pivot (fulcrum) and the effort.	Scissors, wheel barrow, stapler.
Class 3 Levers	The effort is between the pivot (fulcrum) and the load.	Tweezers, tongs, pliers.

Task 2

In pairs or small groups, draw or model a fulcrum using a simple lever to lift a load, such as a playground seesaw. To make this you can use everyday items found in the classroom or workshop such as a ruler and a suitable pivot for the fulcrum.

Label or identify the fulcrum, load, effort and discuss or experiment ways of making the load easier to lift.

Learners make a model using simple resources such as a ruler and whiteboard marker as a pivot and experiment with moving the pivot closer and further away from the load and effort with differing loads and forces.

Learners measure and record their results to form conclusions of their findings. To contextualise this learning, ask the learners to relate their findings to other applications.



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