Levers

Simple machines can change the direction or size of a force by using ‘mechanical advantage’ to multiply force. A lever is balanced on a fulcrum, which allows it to pivot. A load is lifted by placing effort on another part of the lever. A lever involves moving a load around a pivot using effort (or a force).

Examples of tools that are classified as levers include scissors, pliers, hammer claws and tongs.

Levers are a simple machine that increase force

For a tool to be classed as a lever there must be:
- a rigid handle
- a fulcrum (or pivot) around which the handle rotates
- a force increase – caused by the distance from the effort force to the fulcrum being larger than the load force to the fulcrum

Load force $L \times d = $ Effort force $E \times D$
Levers are a simple machine that increase force

Levers are classified in classes depending on the position of the effort and load in relation to the fulcrum.

- **Seesaw type Lever (Class 1):** A lever where the load force acts on the opposite side of the fulcrum to the effort force. Examples include a Crowbar, Hammer and Tyre iron.

  ![Class 1 Lever Diagram](image1)

- **Wheelbarrow type lever (class 2):** A lever where the load force acts on the same side of the fulcrum as the effort force. Examples include a Wheelbarrow, a Spanner and a Ratchet/tiedown.

  ![Class 2 Lever Diagram](image2)

**Inclined Planes**

An inclined plane is a simple machine and it can be used to reduce the effort required to move a load. If the slope has a small angle, then a person has to push or pull the object over a longer distance to reach a height, but with very little effort. If the slope is steep, with a greater angle, a person must push or pull the object over a very short distance to reach the same height, but with more effort. Mechanical advantage is calculated by length of slope divided by height of the slope. There is a greater mechanical advantage if the slope is gentle because then less force will be needed to move an object up (or down) the slope.

![Inclined Plane Diagram](image3)
1. Label the diagram below with fulcrum, effort force and load force.

2. Using the information above – how much force (N) does the boy need to use to lift the box? **EXTENSION**

   \[ \text{Load force (L) x d} = \text{Effort force (E) x D} \]

3. List as many examples as you can for each of the classes of levers

<table>
<thead>
<tr>
<th>Seesaw type lever (class 1)</th>
<th>Wheelbarrow type lever (class 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>