

# Western Engineering Outreach

*Levers: A Simple Machine!*

*Grade 3-5*

*Meet Today's ENG HERO!*



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Since joining the Faculty of Engineering at Western in 1999, Dr. Wood's field of research has primarily been on Lightweight Structural Materials with a particular focus on process-structure-property relationships for die-cast magnesium alloys and polymer composite materials.

To learn more about Dr. Wood visit:

[https://www.eng.uwo.ca/mechanical/faculty/wood\\_j/index.html](https://www.eng.uwo.ca/mechanical/faculty/wood_j/index.html)

## *Learning Goal:*

- Students will consider how levers are very important simple machines and explore the ways they are used in the world
- Curriculum Connections: Grade 4 - Simple Machines; Grade 5 - Understanding Structures and Mechanisms

## *Materials Needed:*

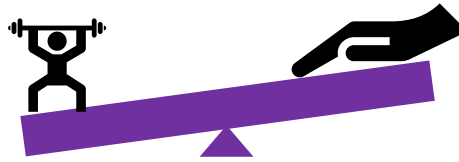
- Ruler
- Pencil
- Paper
- Pen
- Water bottle
- Calculator



## Engineering and Science Connections:

Today we will become mechanical engineers. Mechanical engineers solve problems and create things that move.

Today we will be exploring levers. What is a lever? Well a lever usually just a long bar with a fulcrum (pivot point). You can apply force in one direction, and the pivot point re-directs the force in another direction. To lift the load on one end, you may need the same weight, or more weight or less weight on the other end. This depends on where the weight is!

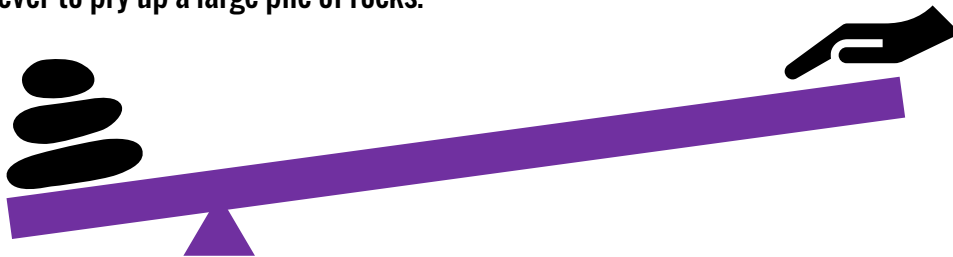


There are three classes of lever. A first-class lever has the fulcrum in between the effort and the load (e.g. between you and the weight you're trying to lift). You push down on one end, and the other raises up.

Class 1. If the fulcrum is in the middle (like on a seesaw or a balance scale), to lift 1 kg on one side of the bar you would need to apply 1kg of force to the other side. There's no mechanical advantage (i.e. the lever doesn't let you lift anything heavier than you could normally lift).



Class 2. If you place the fulcrum very close to the load, and have a long bar to press down on, this gives you a mechanical advantage - it makes it easier to lift the load. You might do this if you had a very heavy load to lift, such as using a long lever to pry up a large pile of rocks.



Class 3. The load is in between the fulcrum and the effort. The best example is a wheelbarrow. You lift up on one end, and the fulcrum rests on the ground. Another example is a bottle opener where the fulcrum tucks under the edge of the lid, and one end of the bar rests on the lid.



*Video Recommendation: Super Simple Machines: Levers*

<https://www.youtube.com/watch?v=lueqFOlxLyc>

### Activity:

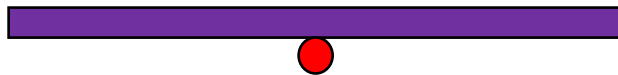
Before beginning, think about the following questions:

- What are other examples of levers?
- Have you ever used a lever?
- Can a lever make it harder to lift something?

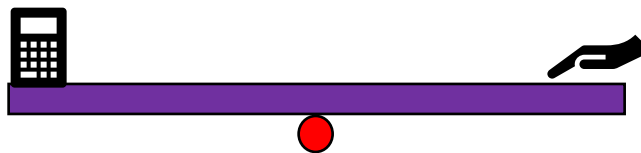
### Time to begin

Today's activity we will be learning how levers work!

Step 1. Place your ruler on top of your pencil so that the pencil looks like a class 1 lever



Step 2. Place the calculator on one end and try to push down on the other, observe the difficulty and record it on the piece of paper.



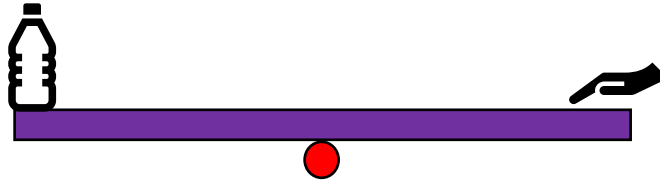
Step 3. Now move the fulcrum closer to calculator, what do you observe? Is it easier to lift or harder? Record your findings on the piece of paper.



Step 4. Now move the fulcrum closer to the end that you were pushing on, what do you observe? Is it easier to lift or harder? Record your findings on the piece of paper.



Step 5. Repeat step 2 to 4 with the water bottle, what do you observe?



### What Did You Learn?



- What is a lever?
- What is a mechanical advantage?
- What can you do with levers?
- What are common levers used today?

### Future Learning



- Look up what other simple machines are being used in the world
- Look at how catapults use tension and levers to fire objects large distances

### Share your creations!

We would love to see what you made. Email us at [discover@uwo.ca](mailto:discover@uwo.ca) or tag us on social media.

Instagram: @westernueng

Twitter: @westernueng

Facebook: @westernueng

Thanks for discovering with us!