

# Building a Lever to Lift a Weight

## **Common Core Standard:**

**NGSS Standard:** 4-PS3-4 Energy:

Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

## **Lesson:**

Understanding Simple Machines – Lever

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## **Objective:**

- Students will design and build a lever to lift a small weight.
- Students will test different positions of the fulcrum to determine how it changes the amount of force needed to lift the weight.
- Students will understand the concept of mechanical advantage and how simple machines like levers make work easier.

## **Materials:**

- Wooden rulers or flat boards (to act as the lever)
- Small blocks or weights (erasers, toy blocks, or small stones)
- Support objects (books, wooden blocks, or sturdy boxes to act as the fulcrum)
- Measuring tape or ruler
- Markers or tape for measuring distances
- Notebook or worksheet for recording results

## **Safety Precautions:**

- Handle all materials carefully, especially when adjusting the fulcrum position or lifting weights.
  - Ensure students work in pairs to prevent accidents and to support each other during the experiment.
  - Remind students to be cautious when testing the lever with weights to avoid pinching fingers.
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## **Procedures:**

- 1. Prepare the Materials:**
  - Distribute the materials to each student or group (rulers, weights, and support objects).
  - Set up a work area where students can easily access all the materials.
- 2. Build the Lever:**
  - Students will place the wooden ruler on top of the support objects to create a lever. The support objects should act as the fulcrum (pivot point) under the ruler.
  - Begin by placing the fulcrum in the middle of the ruler and place a small weight (block) on one side of the ruler.
  - Ask students to lift the other end of the lever to observe how much force it takes.
- 3. Experiment with Fulcrum Positions:**
  - Now, students will experiment by moving the fulcrum closer to the weight and farther from it. They will test how changing the position of the fulcrum affects the force needed to lift the weight.

- Students should record the results, noting how far the fulcrum is from the weight and how much effort is required to lift it.
  - 4. **Analyze Results:**
    - After testing, students should compare the positions where the fulcrum was placed and the amount of force used.
    - Discuss with students how moving the fulcrum changes the mechanical advantage and makes the lever more efficient at lifting heavier objects with less force.
  - 5. **Reflection and Conclusion:**
    - Ask students to write a short reflection on how using a lever made lifting a weight easier and why it worked.
    - Have students present their findings to the class and discuss what they learned about simple machines.
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**Note:** Clean-up

- After completing the project, students should work together to clean up the materials. Make sure they return the rulers, weights, and support objects to their proper places.
- Remind students to safely store any sharp or heavy objects used during the experiment.
- Ensure the work area is cleared of any items that might cause accidents.