

# Simple Machines

## **Introductions:**

- Simple machines are supposed to make work easier or faster. That's the central message of this unit on forces and machines. Understanding the physics and mechanics of forces and simple machines is fundamental to understanding how the world works. This kit will make teaching these concepts easier for you by:
  - Motivating: Each unit begins with a simple demonstration to motivate girls. The demonstration will perplex them with unanswered questions.
  - Building Concepts: The experiments build knowledge through a series of concrete steps. Girls explore, ask their own questions, and make their own discoveries first. These concrete experiences enable them to internalize scientific explanations, definitions, and principles.
  - Using Context: Real-world problems begin each unit to answer the nagging questions. These problem-solving challenges have many solutions for girls to propose and explore. They also provide a tool for closure and assessment; girls must apply the knowledge they have gained through experimentation to the situation at hand.
  - Expanding: Included in this teaching guide are many cross-curricular extensions. They can be used to help children recognize the broad applications of science.

## **Age Level:**

- Juniors and Cadettes

## **Activity Summary:**

- First Class Levers: Seesaw Power
  - Moving a load requires force. Using levers to move a load usually requires less force. Construct a first class lever and identify the fulcrum, force arm, and load arm. Experiment to discover the relationship between the length of the force arm and the amount of force required to move a load.
- Second Class Levers: Rickshaw Races
  - Construct and experiment with a second class lever to determine how to position the load, fulcrum, and force to make the machine more efficient.
- Third Class Levers: Going to Bat
  - Construct and experiment with third class levers to discover that the force applied exceeds the load. Identify through review the three types of levers.
- Inclined Planes: Ramp Power
  - Experiment to discover how the angle of an inclined plane and the force of friction affect the amount of force needed to move a load.

- Wedges: Bulldozin'
  - Recognize wedges as double inclined planes. Experiment to discover how the angle of a wedge affects the amount of force needed to move a load.
- Screws: Fasten-ation
  - Recognize screws as inclined planes spiraled around a cylinder. Experiment to discover the relationship between thread pitch (the distance between the spirals) and force.
- Wheel and Axle: Circle Power
  - Experiment to discover the relationship between the size of the wheel and the force. Identify wheels and axels in complex machines. Construct and evaluate a pinwheel and a waterwheel.
- Pulleys: Ups and Downs
  - Construct several pulley systems and experiment to discover the relationship between fixed and movable pulleys, the length of the pulley, and force.