



**Step within a Badge**  
**Crane Design Challenge – Junior**  
**Step One: Explore Simple & Compound Machines**

Explore the science of simple and compound machines by completing Step 1 of the Crane Design Challenge Badge for Juniors! Information for this activity is based off of Volunteer Toolkit and GSUSA badge work.

#### Materials

- Paper
- Pencil
- Crayons, markers, or colored pencils
- Examples of simple and compound machines

#### Introduction

- This activity was created to help jumpstart your thinking and exploration of simple machines and how they relate to the engineering of cranes and hoists.
- Review this list of important crane engineering terms:
  - Simple machine: A simple machine helps you make work easier by using less force or by applying a push or pull in a different direction.
  - Compound machine: When you put two or more simple machines together to make work easier.
  - Crane: a compound machine that uses levers, pulleys, and wheels & axles to make moving things easier.
  - Hoist: a device used for lifting or lowering a large object.
  - Work: work is defined as applying a force over a distance in the same direction as the force.

#### Activity 1: Exploring Simple & Compound Machines

- How can we make the work we do easier?
  - Think of ideas on how you could make doing chores, sports, or homework easier.
  - Think beyond the help of technology—think about really simple or basic inventions.
    - Make a list of ideas or use your computer to search for examples. If you are doing this activity with a sibling, friend, parent/guardian, share your ideas with each other.
- What is a simple machine?
  - A machine that helps you make work easier by using less force or by applying a push or pull in a different direction.
  - Work is the amount of energy necessary to move an object.
  - There are six kinds of simple machines: pulley, lever, wedge, wheel and axle, inclined plane, and screw.
- What is a compound machine?
  - A compound machine is when you put two or more simple machines together to make work easier, you get a compound machine.
  - A compound machine has moving parts.
  - Examples: Bicycle (the wheels and pedals each form a separate wheel & axle system), Wheelbarrow (combines a lever and a wheel & axle), and Scissors (two pivoting levers).
- Simple & Compound Machine Scavenger Hunt!
  - Take 5-10 minutes and walk around your home to find an example of each simple machine. If possible, take a picture of each one if you can't physically bring it back to where you are completing this activity.

## Scavenger Hunt Examples

\*pictures retrieved from Google



Wheel & Axle



Pulley



Inclined Plane



Wedge



Screw



Lever

## Activity 2: Ask, Rate, and Create!

- Ask
  - If you could only have one machine (simple or compound), what would you choose and why?
  - Think about this, then either answer out loud or write this down and share.
- Rate
  - On a scale of 1 to 6, with 1 being the most important, rate the six simple machines from most important to least important.
    - Pulley, lever, wedge, wheel & axle, inclined plane, and screw.
  - Once you come up with your ratings, share and give your reasons.
  - What would happen if there were NO machines making our work easier?
- Create
  - Create a drawing of a compound machine that would make something you don't like to do easier.
  - Work on this independently or in a group!
  - Once you're done, make a mini presentation of your new compound machine.
    - Get creative and fun by pretending you're on an episode of *Shark Tank*—where people present new ideas for products and inventions.