

## Drop-In Session B:

# Introduction to Simple Machines

### Overview

Junior FIRST® LEGO® League team members will work together and use LEGO® elements to learn about some useful types of simple machines.

**Sessions:** 1 Session

### Time

- Session 1: Introduction to Simple Machines  
*Suggested Time: 1.5 hours*

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### Materials

- LEGO Jr.FLL Base Kit 991726 (North America Only)
- Assorted LEGO elements
- Junior *FIRST* LEGO League Guide to Building and More (North America Only)
- Whiteboard or other writing surface
- A ball
- Paper
- Art supplies

**Hint:** If the LEGO Jr.FLL Base Kit or LEGO BuildToExpress mini-kits are not available to you, any assortment of LEGO can be used.

### Learning Objectives

#### Language Arts

- Acquire and accurately use grade-appropriate, domain-specific words and phrases.
- Ask and answer questions about information from a speaker.
- Explain one's own ideas and understanding.
- Follow agreed-upon rules for discussions.
- Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

#### Principals of Engineering Design

- Follow a construction plan.

#### Science:

- Explore the six Simple Machines.

#### Teamwork Skills

- Work together as a team.

## Session 1

### Introduction to Simple Machines (1.5 hours)

#### Session Placement

This session can be used anytime throughout the Jr.FLL season. It fits particularly well after *Build It! Session 1: Discuss the Engineering Design Process and Simple Machines*.

#### ↓ This Time:

In this session, the team will use LEGO elements to explore the six Simple Machines.

#### Inspiration

**Suggested Time: 15 min**

Simple Machines are the basis for all mechanical movement. The Simple Machines are six, basic mechanical devices that are used to apply force.

The Six Simple Machines are:

- **Gears:** toothed wheels that mesh together to transmit motion
- **Pulley:** a wheel with a grooved rim in which a rope or chain can run to change the direction of the pull, to lift a load
- **Lever:** a rigid bar resting on a pivot, used to help move a heavy load with one end when pressure is applied to the other
- **Wheel and Axle:** an axle to which a wheel is fastened so that torque applied to the wheel winds a rope or chain onto the axle
- **Inclined Plane:** a plane that is set at an angle to the horizontal, especially to raise or lower a load by rolling or sliding
- **Screw:** a metal pin or rod with one or more spiraling threads; can be driven as a fastener

Brainstorm a few simple machines that the team members see every day and encourage them to think about where they see them.

These might include:

- Gears on a bicycle or in another machine (gears)
- A crane (a pulley)
- A pair of scissors (a lever)
- The wheels on a car (a wheel and axle)
- Tobogganing down a hill (an inclined plane)
- A table vice (a screw)

## Activity

**Suggested Time: 70 min**

Team members will begin to develop their teamwork skills.

1. Ask members of the team to each come up with an action that represents one of the simple machines.
2. Create an icon for each of the six simple machines. The icons should show how the simple machines work, or what they can do. Ask students to think about the sort of motion each Simple Machine uses.
3. Post the icons created by the team on the white board or save them to include later on their *Show Me* poster.
4. Have team members work together to learn more about two types of common simple machines, and have them build models that use these machines out of LEGO elements. These machines will be useful when they build their model for the annual challenge. Begin by using the “Two Everyday Simple Machines” lesson plan on p.11-15 of the *Junior FIRST LEGO League Guide to Building and More* (North America Only). If this document is not available, teams can create their own examples of everyday simple machines using every day objects for inspiration.

Ask the team members questions such as:

- What are some different types of gears?
- What do the different types of gears do?
- What are some different types of pulleys?
- What are the different types of pulleys good for?
- What is a mechanism?

**Hint:** If time allows, have team members take pictures of different Simple Machines that they might be able to use in their team’s model.

5. Apply what the team has learned about the six Simple Machines by following one of the suggestions below:

### **Option A: Gears**

Apply what they have learned about gears by completing the Crazy Floor Model activity on p. 16 of the *Junior FIRST LEGO League Guide to Building and More* (North America Only).

### **Option B: Pulleys**

Apply what they have learned about pulleys by completing the Crane Model activity on p. 44 of the *Junior FIRST LEGO League Guide to Building and More* (North America Only).

### **Option C: Simple Machines Game**

Have the team line up in a single file line. Tell the team that they are going to pretend to be a machine that’s job it is to pass a ball down an assembly line. Start at one end of the line and have team members pass the ball forward. As they pass the ball, each team member should make a motion that mimics a simple machine they have learned about. Encourage the team to make noises, or sounds, or say descriptive words as they complete they pass the ball forward.

After they have finished, have team members draw the machine they acted out, and then use LEGO elements to build the machine.

**Hint:** If time allows, complete all three activities. This will give team members a chance to apply what they have learned about gears and pulleys.

### Follow-Up

**Suggested Time: 5 min**

Review the team's accomplishments from this session by discussing what they learned about Simple Machines and having them share their models with other students or community members.

In this session, the team:

- Learned about Simple Machines.
- Explored different types of Simple Machines in greater detail using LEGO.