Materials You Need To Get To Teach With This Unit

There are some materials you will want to gather before starting version 1.0 of the Machines that Help unit. Please note that if you choose to have students crack nuts in the messing about activity or product comparison task, nuts with shells are only available seasonally, not year round in some parts of the country. You may have to buy bags of mixed, unshelled nuts around the winter holidays in order to have them available for use when the time comes to use Machines That Help.

Other materials you will need to do this unit include:

Things That Help Make Lifting Easier (initial demonstration)

1	Medium-sized can of food or drink (≈1.4 kg)
1	Large-sized can of food or drink (≈3.1 kg)
1	Spool of single-strand cotton thread
1	2 x 6″ 8′ or longer board of lumber

You'll be using the cans and thread to show what the challenge is, and the board to demonstrate that while you can't lift something heavy (like a person) directly, you can with the help of a simple machine (board as lever).

Doing a Deadlift With a Single Thread

1 per team	Medium-sized can of food (≈1.4 kg) (Use lighter can if desired.)
1 per class	Spool of cord or kite string
1 per class	Roll of duct tape
1	Spool of single-strand cotton thread

Hint: Check to make sure that the cotton thread you use breaks when lifting the can. It should take between 2-3 strands of thread to lift the can directly up.

First Can-Lift Challenge

Removing Bolts - Homework

1 per team	Socket to fit the bolt's head
2 per class	Ratcheting socket wrenches (see page 11)

Cracking Nuts - Homework

1 per team	Dozen nuts of various types including walnuts, pecans, and almonds
1 per team	Lever-type nutcracker or 4″ C-Clamp
2 per team	Short pieces of lumber, e.g., 1″x2″x4″

Can-Lift Plan 1: Using Levers

1 per team	3 x 35-cm long piece of pegboard

1 per team	30-cm long piece of handle moulding, with sandpaper glued to the top
1 per class	Box of paper clips
1 per team	8-10 1/4" washers (in a plastic bag)
2 per team	Wooden yardsticks (or meter sticks)
2 per class	Low-temperature glue guns (with glue sticks)
1 per team	Cord or kite string, 1 meter
1	Collection of cases of lever-based simple machines (scissors, pliers, crowbar, nail clippers, toothbrush, flyswatter, and so on)

Can-Lift Plan 2: Using Ramps & Inclined Planes

1 (opt. demo)	Door stop, wedge for splitting lumber
1 per team	Cardboard box, lid or bottom (banana box, box for copy paper)
2 per team	Lumber 2x4", lengths between 1 and 3'
1 per class	Roll masking or duct tape
1 per team	Heavy-duty scissors
1 per team	Cord or kite string, 1 meter

Can-Lift Plan 3: Using Pulleys & Block-and-Tackle

1 (opt. demo)	Pulley, come-along, block-and-tackle
1 per team	Plastic straw, large [slide over wire axle]
2 per team	wire coat hangers
2 per team	empty wooden thread spools
1 per team	Cord or kite string, 1 meter
1 per 2 teams	Pliers: lineman and needle-nose pliers

Can-Lift Plan 4: Using Cranks & Windlasses

1 per team	10 x 40 cm piece of pegboard
1 per team	Small cardboard box
4 per team	Regular hex nuts, washers, 1/4" coars thread
1 per team	8"-long carriage bolt, 1/4" dia coars thread
1 per team	3"-long carriage bolt, 1/4" dia coars thread
1 per team	Plastic straw, large [slide over axle]
1 per team	Cord or kite string, 1 meter
1 per team	Duct tape, 1 meter

Can-Lift Extra Helper Plan: Using Wheels & Axles

1 (opt. demo)	Coaster car, assembled
1 per team	Foamcore or cardboard, 10 x 30 cm piece
2 per team	6"-long carriage bolt, 1/4" diam coarse thread
4 per team	Nuts, 1/4" coarse threads
4 per team	Wing nuts, 1/4" coarse threads
8 per team	1/4" washers (optional)
1 per team	Duct or masking tape, 1 meter
1 per team	Plastic straw, large [slide over axle]