Sample Grade 5

STEM Challenge:
# Mousetrap

**Task:** Students will work in small groups to design and create a humane mousetrap that captures a mouse in a bucket for release somewhere else.

## Getting Started

### Build Content Knowledge

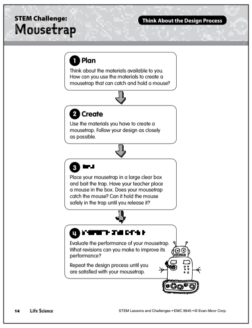
If you wish to provide students with background knowledge about the inclined plane and wheel and axle, reproduce and distribute pages 10 and 11. Then have students read and discuss the science concept and the visual literacy graphics on those pages.

### Introduce the Challenge

Reproduce and distribute the STEM Challenge on page 12. Then have students read the challenge and the testable goal. Discuss the materials with the students and decide on a plan for gathering the materials.

Next, have students research components of humane mousetraps that make them work. Have them use the STEM Planner on page 8 to think about how science, technology, engineering, and math are used to create a mousetrap. Finally, have students independently brainstorm and draw their ideas on page 12.

## Completing the Challenge

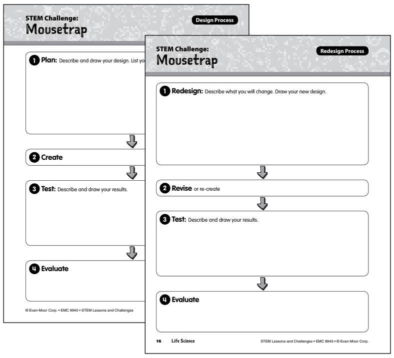


Assign students to small groups.

### Optional: Model the Design Process

You may wish to reproduce and distribute page 14 to students. This resource is intended to help students think about how to approach each step in the design process.

### Design Process Worksheets



Reproduce and distribute the STEM design process worksheets to students. Provide support when needed to help students describe and evaluate their plans.

### After the Challenge

Have students share their design processes, compare their mousetraps, and brainstorm ideas for improvements.

# Simple Machines That Move You

An **inclined plane** is a flat surface that is raised at one end. An inclined plane may not look like much of a machine, but this nifty tool can make work much easier. The most common example of an inclined plane is a simple **ramp**. Think about someone in a wheelchair who needs to get from the street up to the sidewalk or into a building that has a stairway to the front door. A ramp, or a series of ramps, joins the two different levels smoothly. Someone loading heavy boxes into or out of the back of a truck would find the job much easier if the boxes could be pushed up or slid down a ramp. Ramps can also be used to easily increase the height a person can go. A skateboard ramp can launch a rider high into the air, and walking up a hill is a natural way to get a better view.

An inclined plane makes the work of traveling upward easier by spreading out the effort over a longer distance. This might not seem obvious if you are just stepping up onto a curb or carrying a carton of milk to the trunk of your car. But think about how you'd move a new couch into your second-floor apartment!

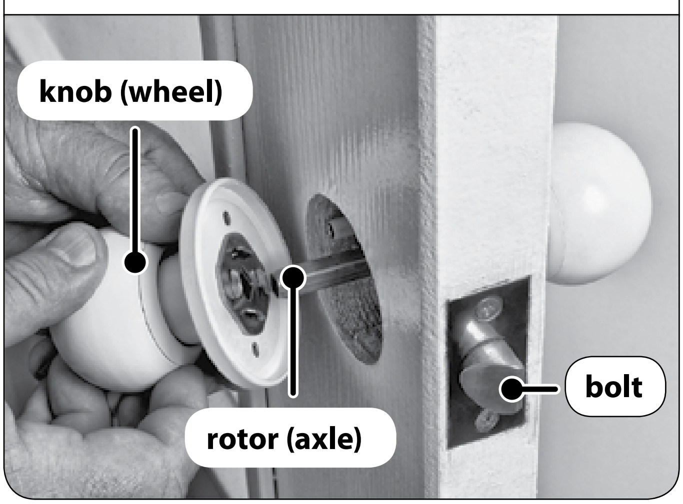
Round things also move easily. With no edges in the way, they roll freely. **Wheels** have been used on carts and other vehicles ever since the invention of the **axle**, which joins the wheels, but many devices use a wheel-like object with the axle to cause different kinds of movement. For example, fans use an axle to turn a “wheel” of blades that move air. A rolling pin is a cylinder that can spin around an axle, which provides handles on both sides. A cylinder is just a really thick wheel. The rolling pin moves across dough to flatten it. A doorknob acts like a wheel (no matter what shape the doorknob is), which turns an axle that moves a bolt out of the doorway. The force from the part you turn is transferred to the other part, making movement easier.

# STEM Challenge: Mousetrap

This short **ramp** makes it possible for the man in the wheelchair to access the door, but a longer ramp would be less steep and even easier to move up.

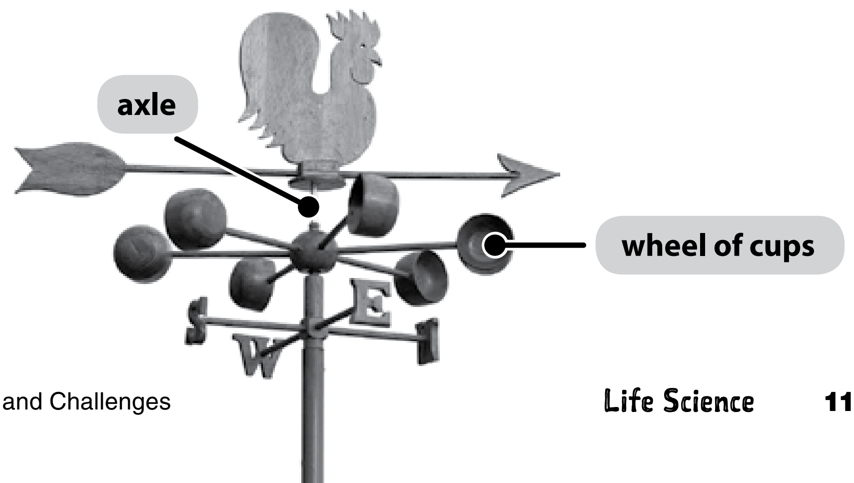
A chicken uses a **ramp** to reach the loft in the barn.

Turning the knob **rotates** the rotor. The rotor is connected to the bolt, which moves when the rotor is turned.




**Rotating** logs floating in a river challenge these lumberjacks to move their feet to stay upright in the sport of log rolling.

The **"wheel"** of cups turns on the vertical **axle** as the wind blows.



# Mousetrap

**Challenge:** Design a mousetrap that catches a live mouse in a bucket to be released later.

**Testable goal:** The mouse is caught safely in the bucket and cannot escape.

**Research:** Look at pictures of mousetraps. Notice how they are constructed. Think about how science, technology, engineering, and math are used to create a mousetrap.

**Brainstorm:** Draw one or more design ideas for a humane mousetrap. There are many different ways to complete this challenge. Be creative!

# Suggested Materials List

## Item for each group

- [ ] large bucket

## Items for the whole class

- [ ] wooden dowels
- [ ] PVC pipe or paper towel roll
- [ ] rulers
- [ ] glue
- [ ] clean scrap or craft wood planks longer than bucket height
- [ ] paper clips
- [ ] pliers
- [ ] string or rubber bands
- [ ] wire
- [ ] grass or other soft, nonallergenic material
- [ ] ______________________
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## Items for testing

- [ ] pet mouse
- [ ] large clear box with steep sides
- [ ] peanut butter, cheese, or candy
- [ ] spoon or knife

## 1 Plan

Think about the materials available to you. How can you use the materials to create a mousetrap that can catch and hold a mouse?

## 2 Create

Use the materials you have to create a mousetrap. Follow your design as closely as possible.

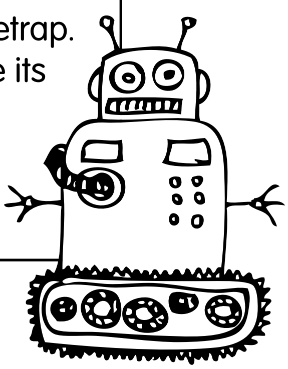
## 3 Test

Place your mousetrap in a large clear box and bait the trap. Have your teacher place a mouse in the box. Does your mousetrap catch the mouse? Can it hold the mouse safely in the trap until you release it?

## 4 Evaluate and Revise

Evaluate the performance of your mousetrap. What revisions can you make to improve its performance?

Repeat the design process until you are satisfied with your mousetrap.



# Mousetrap



**1 Plan:** Describe and draw your design. List your materials.

**2 Create**

**3 Test:** Describe and draw your results.

**4 Evaluate**

# Mousetrap

Redesign Process

**1 Redesign:** Describe what you will change. Draw your new design.

**2 Revise** or re-create

**3 Test:** Describe and draw your results.

**4 Evaluate**