

# DESIGN CHALLENGE: KINEMATIC FANATIC

## KINEMATIC FANATIC:

Can you design and build a system of gears and kinematics to create a hand-stamping machine?

### GOAL:

Working in small teams, students design, build and test a machine to automatically stamp their hands.

### TIME:

30 minutes for activity plus 10 minutes for set up and 10 minutes for clean up.

### Materials:

Gears (with motored drive pack)  
Tape  
Sample hand-stampers  
Examples of mechanisms  
Stamps (mounted to end pieces)  
Stamp pads

## DIRECTIONS

1

**ASK:** Divide students into teams of two or three. Explain the challenge to them from the student worksheet. Discuss the sample mechanisms with them. What can they learn from each one? How does each mechanism change the motion of the machine? Which mechanisms might they want to use in their hand-stamping design.

2

**IMAGINE:** Have students explore the materials and the sample hand-stampers to learn how the gear pieces fit together. Students should brainstorm which types of mechanisms they want to use and how they will combine these into their design concept. They should not build or collect parts yet. Encourage students to create an entirely new design or be inspired one of the sample designs. This is what engineers do all the time!

3

**PLAN:** Ask each team to discuss their ideas and then sketch the mechanisms they will use, but not the details of which parts they will need. (Ex. A sketch showing an arm attached to the geared drive that hits a lever that lifts and drops the stamp.)

## KINEMATIC FANATIC: DIRECTIONS CONTINUED

- 4** **CREATE:** Students should collect materials and then go back to their workspaces and build their hand-stampers according to their plans. Once they have completed construction, they should bring their machines to the testing station where they will place the stamp on the machine and test how their design works. Have students demonstrate the movement of their machine before adding the stamp, and have students check for clearance once they put the stamp on but before they ink the stamp. If students need to make minor modifications to achieve a basic success, they should do so.
- 5** **IMPROVE:** Students should test their designs, checking if they think their machine stamps their hand. Does it stamp clearly? Is it easy to get their hands in and out of the machine in between stampings? What improvements would they suggest? Have students redesign, modify, and test their improved designs.

### FACILITATION TIPS

- We use pieces from *Gears Gears Gears Technology Lab* by Learning Resources, with the added motor and battery pack and removing any wheels so students are not tempted to build cars instead of hand-stampers. Other pieces, such as propellers may be removed as well to provide fewer distractions.
- Try to develop samples that demonstrate many different ways to build a hand stamper. Include some less complex versions that may be less “successful” but will be a good starting point for students who are unsure of where to start. These students will usually develop a more complex machine once they get a feel for how the pieces work together.
- If you can not get the Technology Lab, you may have older students build their own additional pieces with scissors and cardboard.
- Do not allow students to remove the blue gears off the motor packs. They are had to distinguish from the regular small, blue gears.
- Make sure at least one model shows how to tape the rounds to prohibit the exterior from rotating independently of the interior.