Lakeshore®

# CREATE-A-CHAIN REACTION

PP848

## STEM Kit - Gr. 3–5 - Starter Set

©2016 Lakeshore • (800) 428-4414 • www.lakeshorelearning.com

**Targets standards in these areas:**

- Understanding gravity, force, motion, momentum, speed, and properties of materials
- Persevering to solve problems

**What's Included**

- 59 contraption components
- 4 balls
- 4 cords
- 8 challenge cards
- Menu book

**Before You Begin**

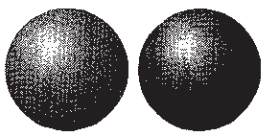
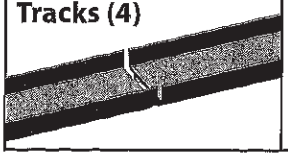
- Clear a large, flat, level area such as a floor or table. For best results, the area should have a solid, smooth surface.

## About the Kit

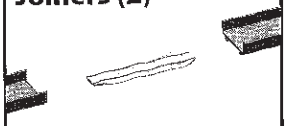
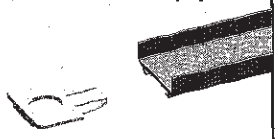
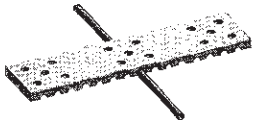
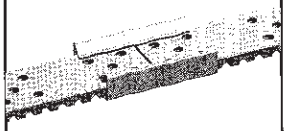
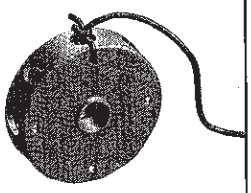
With this fun, engaging kit, students explore concepts like gravity, force, motion, momentum, and speed—while building 21st-century skills like perseverance and problem solving! Students simply use a challenge card, the menu book, and contraption components to create contraptions and set them up in a chain reaction course. They will have to adjust the placement, distances, and angles until the course works perfectly. Students can even create, test, and perfect their own chain reactions.

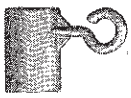
## Investigate the Concept

- The challenge cards task students with creating continuous chain reactions. Each card lists the required contraptions for the chain reaction course. After building a course, students will need to fine-tune it until the ball successfully reaches the goal box. Explain to students that the back of each card shows one possible course configuration. Encourage them to come up with their own ways to make a successful chain reaction.
- Before students begin working with the kit, encourage them to read about the contraptions in the menu book. The book explains what each contraption is good for, how it works, assembly instructions, and troubleshooting tips. The book also provides examples of ways to adjust the basic contraptions to produce different results.
- Following are descriptions and tips for using each component (except the goal box), plus a list of troubleshooting pointers.

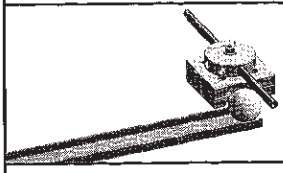
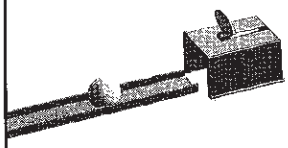
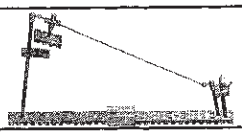
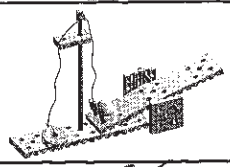
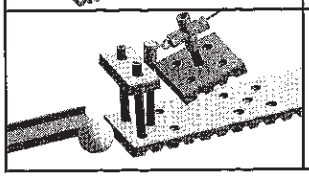
| | |
|---|---|
| **Balls (4)**<br>  <br>Red Green | The kit comes with four **balls**—two green and two red. Because the green **balls** are heavy and dense, they are ideal for pushing contraptions like the switch. The red **balls** are lighter; they work well with courses that use a ball holder.<br><br>**Tip:** The weight of the green **balls** allows them to roll faster and push other components with greater force. To give the red **balls** enough momentum to push other components with adequate force, you might need to place the track at a steeper angle. |
| **Tracks (4)**<br>  | The **tracks** are designed to direct balls through a course.<br><br>**Tip:** Alignment is key! If the **tracks** are misaligned, they might inhibit the balls' movement, causing the balls to lose momentum, stop completely, or fall off the course. |

*(continued)*

| | |
|---|---|
| **Joiners (2)**  | Use these to connect track pieces.<br><br>**Tip:** If unsupported, longer sections of track might sag and cause the balls to lose momentum. Support these areas of the track from underneath. |
| **Stoppers (4)**  | **Stoppers** keep the track pieces from sliding down when they are elevated on one end. You can adjust the placement of a **stopper** by sliding it along the underside of the tracks. For steeper slopes, place the **stopper** closer to the center of the track.<br><br>**Tip:** You can also use the **stoppers** as small risers for slightly elevated or angled tracks. |
| **Ball Holders (2)**  | Use the **ball holders** to keep a ball in place at the end of a track. They slide into the slot on the underside of the tracks.<br><br>**Tip:** It takes greater force to push a green ball out of a **ball holder** than it does to push a red ball out of a **ball holder**. |
| **Long Planks (4)**  | Use these to create high towers or long bases. To create a tower, stand two **planks** side by side and insert a rod into the holes of the **planks** for a crossbar.<br><br>**Tip:** The grooves on the underside help keep the **plank** from moving when placed on a crossbar. |
| **Square Planks (6)**  | Use the **square planks** to create platforms, bases, or short towers. Create a crossbar for your tower by inserting a rod between the holes of two **planks**. |
| **Small Planks (2)**  | Use these to create small bases or low risers. The **planks** can also be used to keep two rods evenly spaced. |
| **Plank Stands (6)**  | Use the **plank stands** to keep planks stable. Sliding a **plank stand** onto the edge of a plank will give it a sturdy base.<br><br>**Tip:** You can also use a **plank stand** to connect planks. |
| **Rods (18)**  | Use **rods** to build your contraptions. The **rods** come in five lengths—2", 4", 6", 8", and 12".<br><br>**Tip:** The menu book details which length of **rod** each contraption requires. However, it is a good idea to test the **rods** to see which works best for the type of reaction you want and then modify accordingly. |
| **Disks (4)**  | Use **disks** to create a variety of contraptions, such as the hammer, switch, or elevator. The holes on the **disk** are designed to produce different reactions. Use the side holes to fit rods snugly to the **disk**. Insert a rod through the large center hole on the face of the **disk** so the **disk** can spin freely. Thread a cord through any of the four small holes on the face of the **disk**, tying a simple knot to secure. |

| | |
|---|---|
| **Connectors (4)**  | Use these to connect rods at different angles.<br><br>**Tip:** You can place a **connector** at the end of a rod or at any point along the length of the rod. |
| **Hook Caps (2)**  | Use a **hook cap** to connect a cord to a rod. Place the **hook cap** on the end of a rod, and then tie a cord to the hook with a simple knot.<br><br>**Tip:** You can also run a cord through the hook and use it like a pulley. |
| **Cords (4)**  | Use the **cords** to create a variety of reactions along your course.<br><br>**Tip:** If two components are connected together by a **cord**, the movement of one component will affect the movement of the other. Experiment with different **cord** lengths to get your desired reaction. |

# Troubleshooting Pointers

| | Problem | What's Happening? | Solution |
|---|---|---|---|
|  | A ball hits the next contraption but doesn't activate it. | The ball doesn't have enough momentum to cause a reaction. | Give the ball greater momentum by placing the track at a steeper angle, or use a heavier ball. |
|  | A ball rolls on the track but doesn't reach the end. | The ball doesn't have enough momentum. | Adjust the bases to give the track a steeper angle. |
|  | A contraption built with a cord activates early or leans to one side. | The cord is too tight or too short. | Lengthen the cord to delay the reaction, or distribute the weight evenly. |
|  | A contraption built with a cord does not activate. | The cord is too long or too loose and does not support the weight of the component. | Shorten the cord. Keep experimenting with the length until you achieve the desired result. |
|  | A ball misses a track or fails to hit the next component in the chain reaction. | The track pieces are not aligned or properly spaced. | Reposition the track pieces. You may need to do this after every test to get consistent results. |

## Meeting Individual Needs

### ❑ ELL

Use the pieces to demonstrate concepts and teach key vocabulary words, such as *distance, speed, momentum,* and *force.*

### ❑ Reteach/Extra Support

In a small group, build the different contraptions featured in the menu book together. Explain the reaction that each contraption will create. Model building a course with two or three contraptions to create a continuous chain reaction. Then invite students to build their own chain reactions using two or three contraptions.

### ❑ Challenge

Encourage students to design and create their own contraptions. Have students reference the menu book as a starting point and then challenge them to create their own designs to add to the book. Instruct students to write about what their contraption is good for, how it works, things to think about, and setup tips. Have them create an assembly guide by taking pictures of each building step. Keep students' assembly guides with the menu book. Then invite other students to incorporate the contraptions into their own chain reactions.

# Talk About Your Thinking

While students are building contraptions, ask the following questions about specific challenge scenarios:

- *What might happen if you make the track steeper?*
- *What might happen if you move the contraption farther away?*
- *What might happen if you use a different ball?*
- *How can you make the ball roll more quickly? How can you slow it down?*
- *What component might you adjust to make the contraption work better? Why will that help?*

# Extend the Learning

To encourage students to create their own chain reactions, ask the following questions:

- *Who can make the longest course?*
- *Can you make a chain reaction that uses all the balls?*
- *Can you make a chain reaction that starts on the table and ends on the floor?*
- *What is the longest chain reaction you can create using only one ball?*

# USE 4 CONTRAPTIONS

to get a red ball into the goal.

8

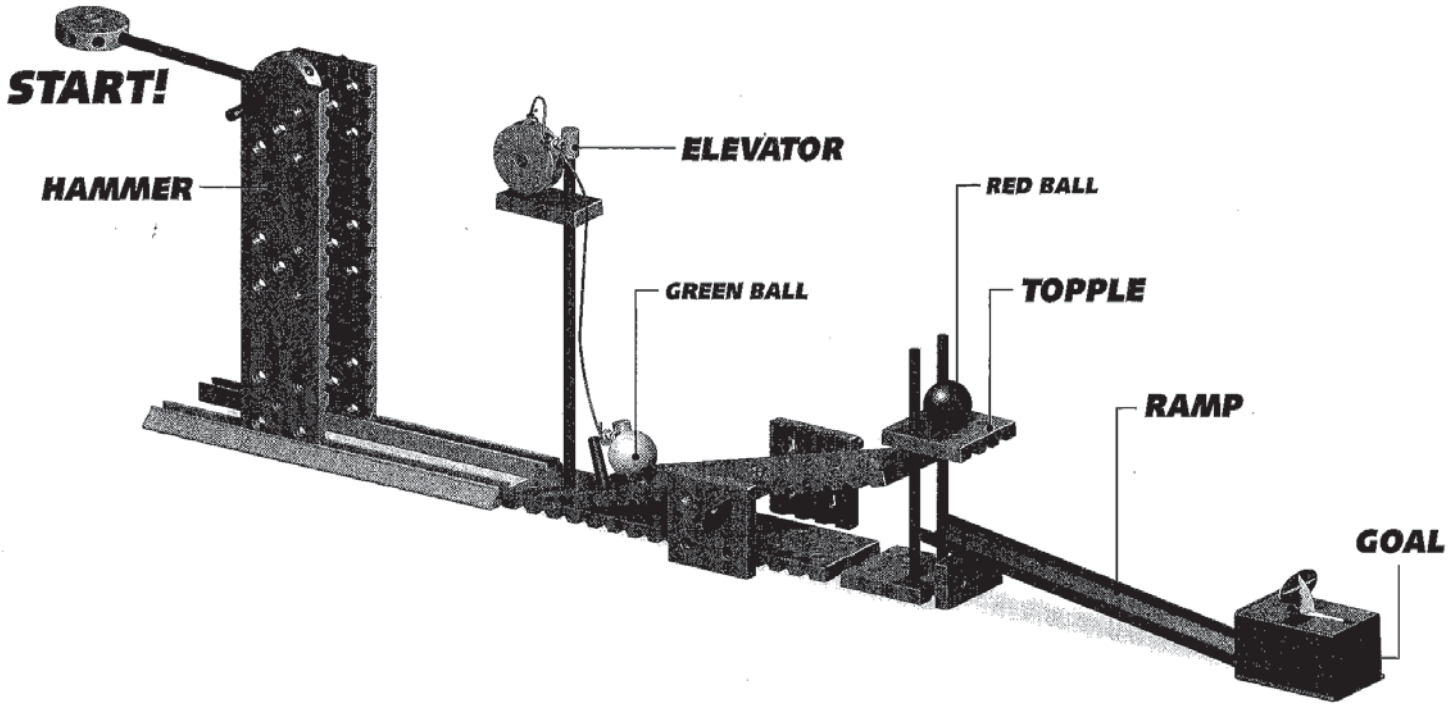
START!

HAMMER → ELEVATOR → TOPPLE → RAMP → GOAL!


-3463
Clinton-Macomb
Public Library

©Lakeshore

## Possible Solution

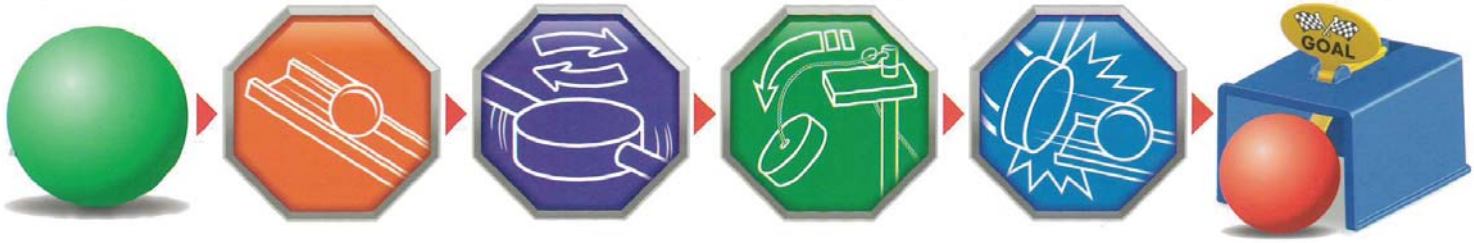


# USE 4 CONTRAPTIONS

to get a red ball into the goal.



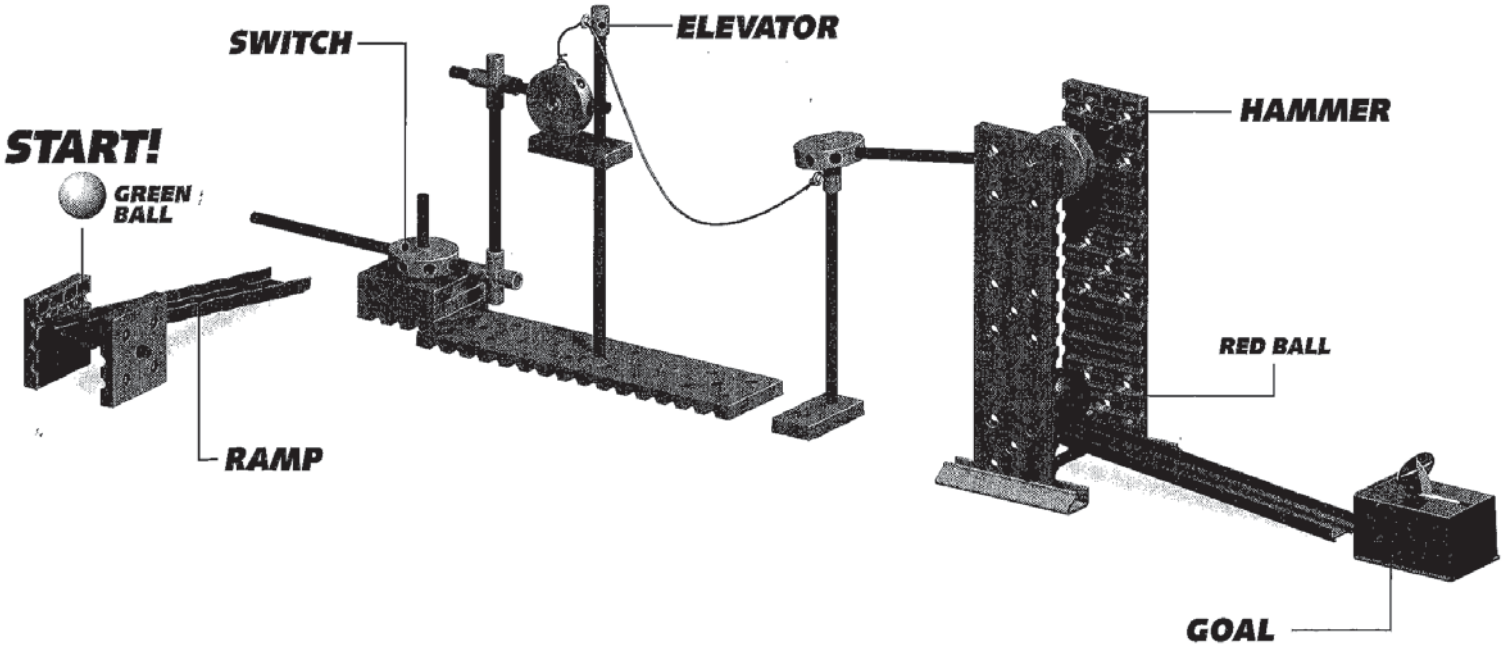
START! RAMP SWITCH ELEVATOR HAMMER GOAL!




Clinton-Macomb
Public Library

©Lakeshore

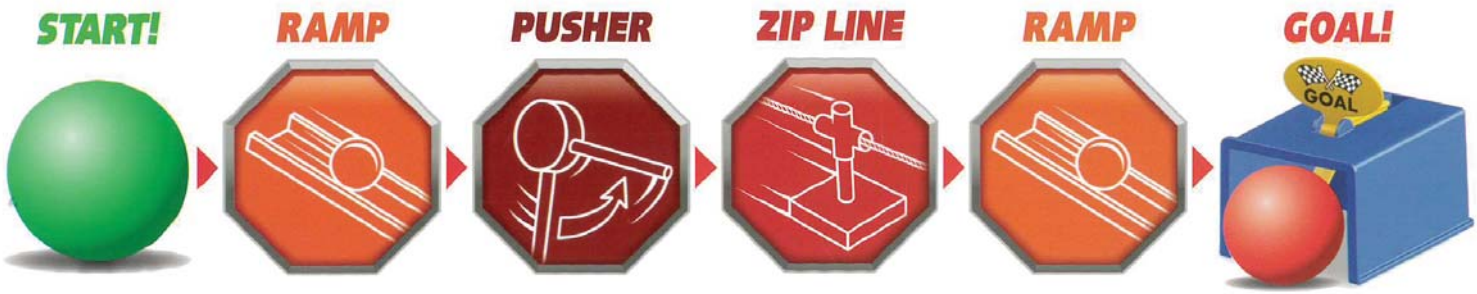
## Possible Solution



# USE 4 CONTRAPTIONS

to get a red ball into the goal.

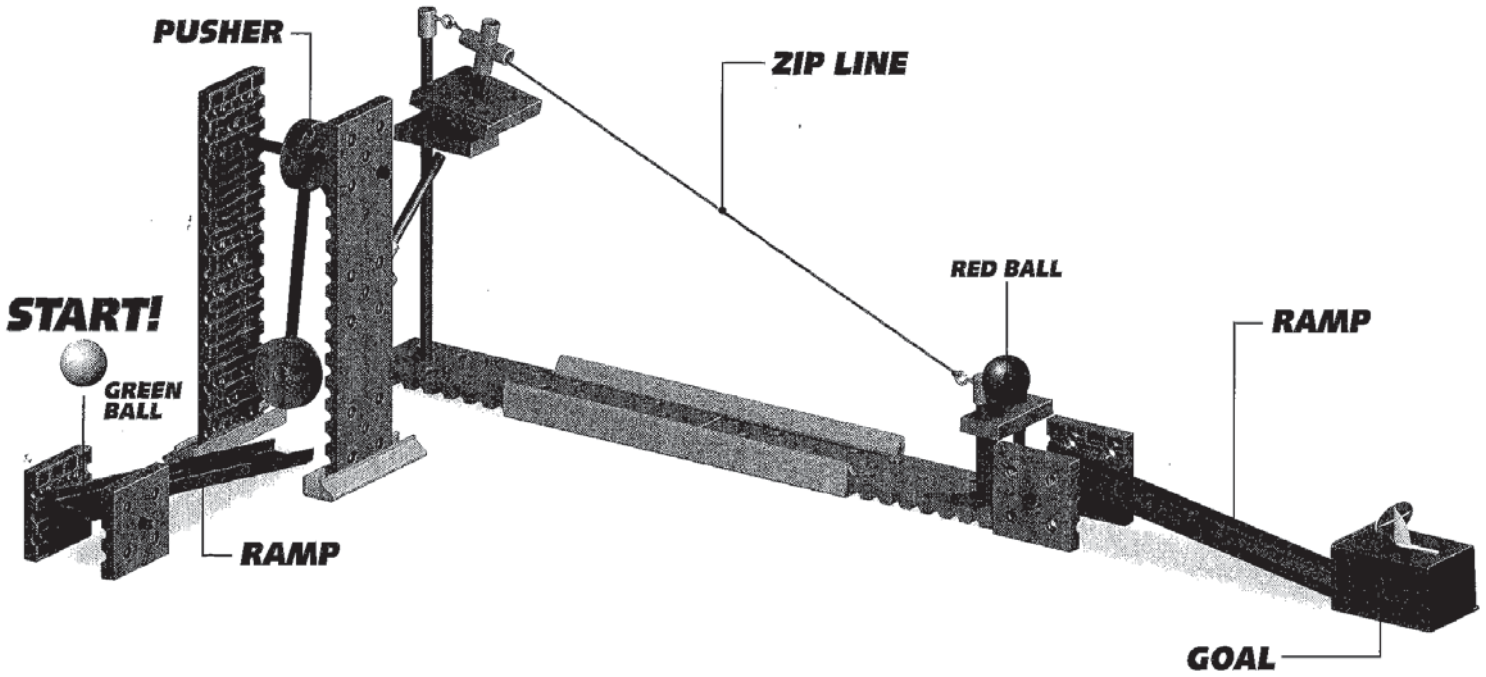
6




-3405
Clinton-Macomb
Public Library

©Lakeshore

## Possible Solution

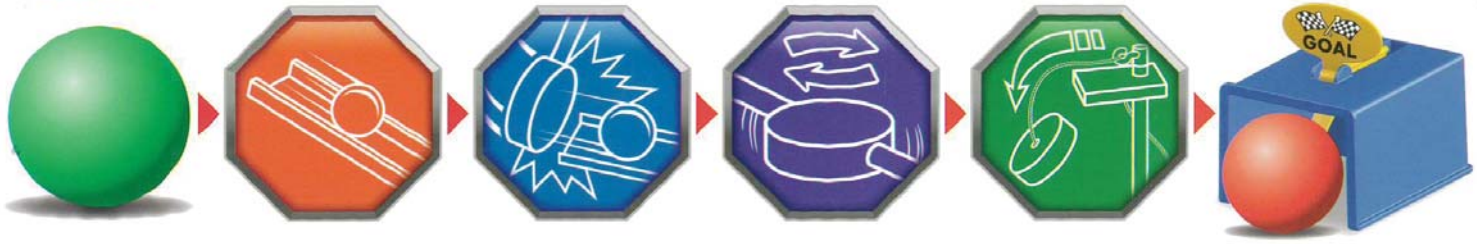


# USE 4 CONTRAPTIONS

to get a red ball into the goal.

5

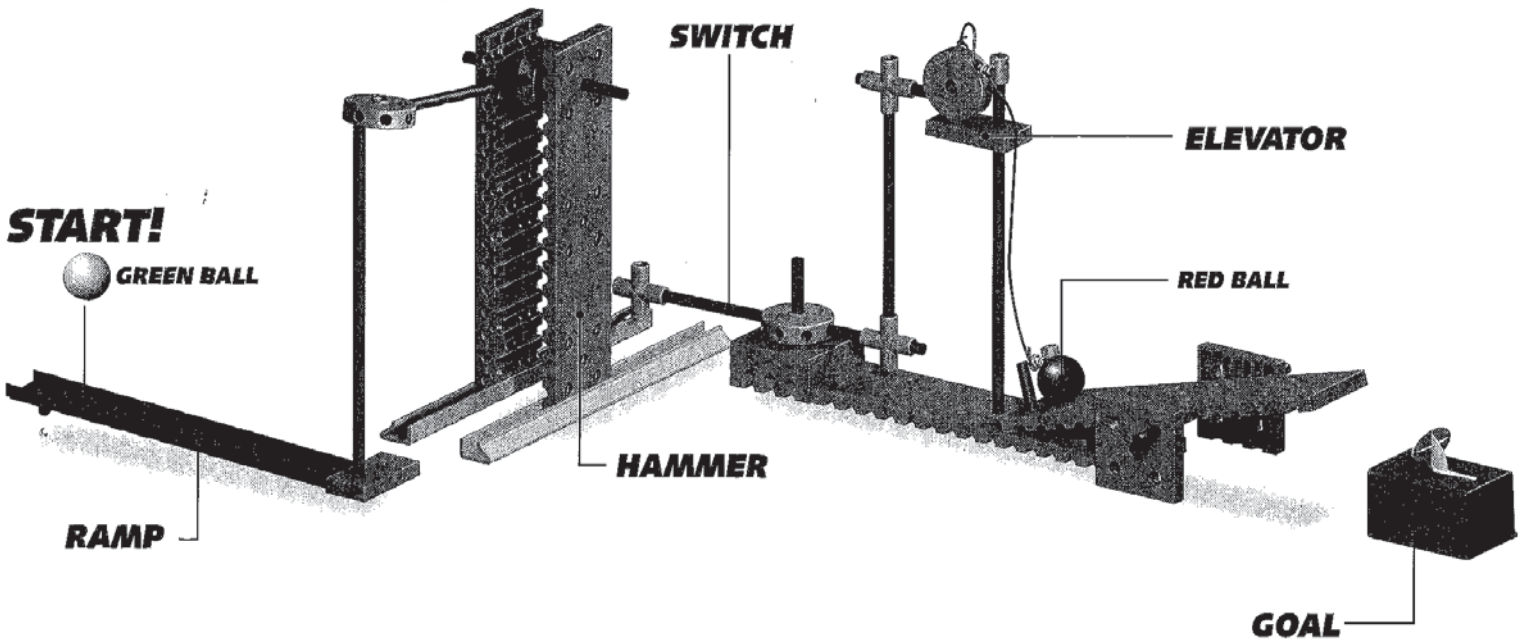
START! RAMP HAMMER SWITCH ELEVATOR GOAL!




~3465
Clinton-Macomb
Public Library

©Lakeshore

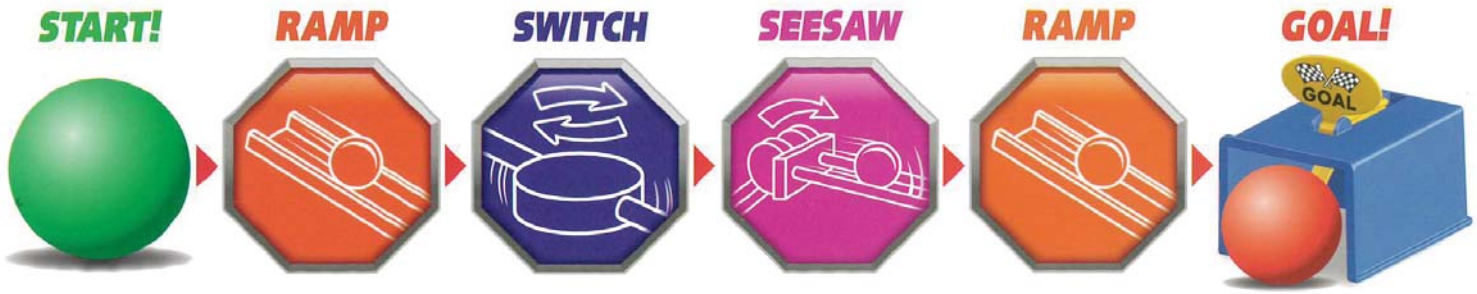
## Possible Solution



# USE 4 CONTRAPTIONS

to get a red ball into the goal.

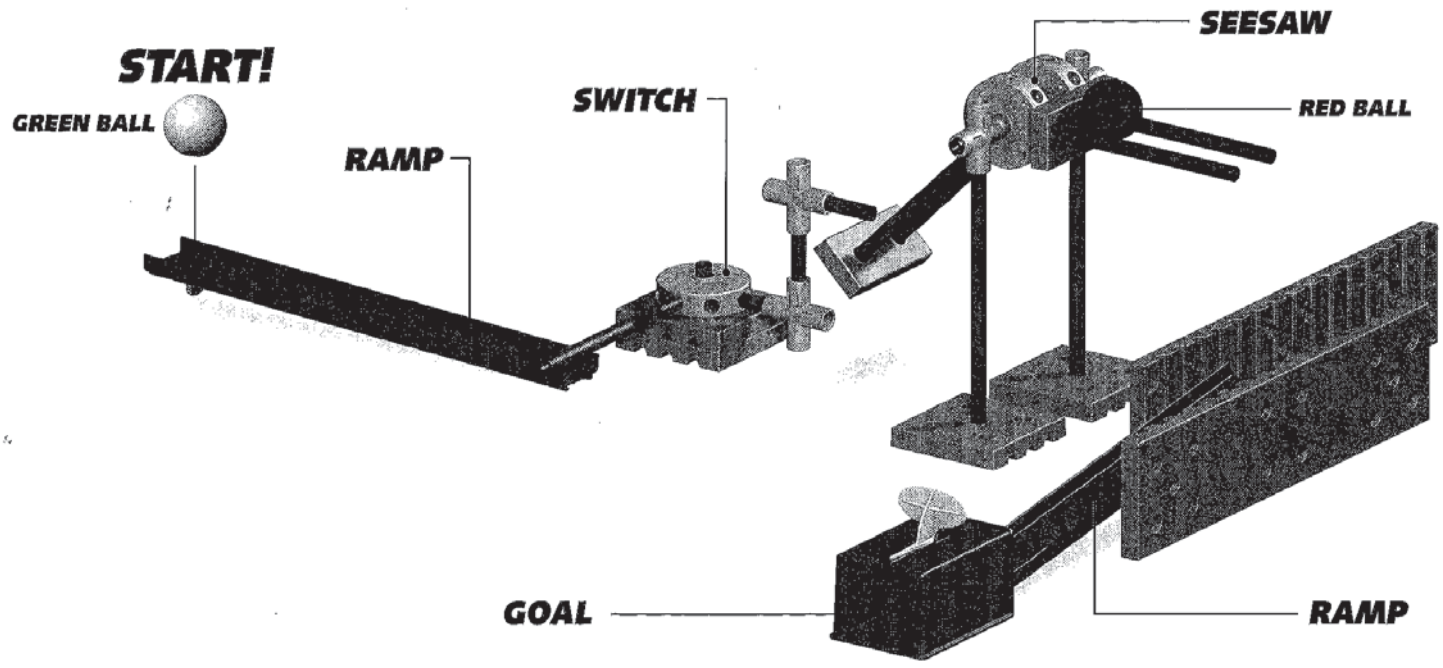
4




-3465
Clinton-Macomb
Public Library

©Lakeshore

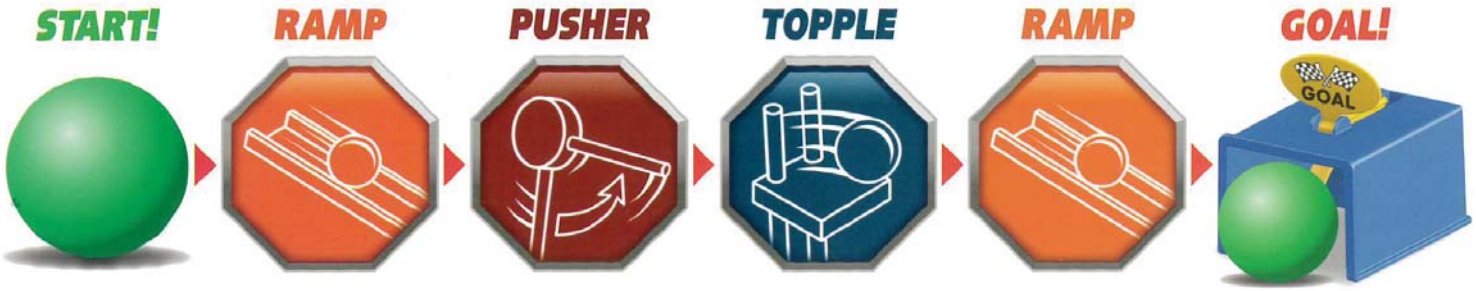
## Possible Solution



# USE 4 CONTRAPTIONS

to get a green ball into the goal.

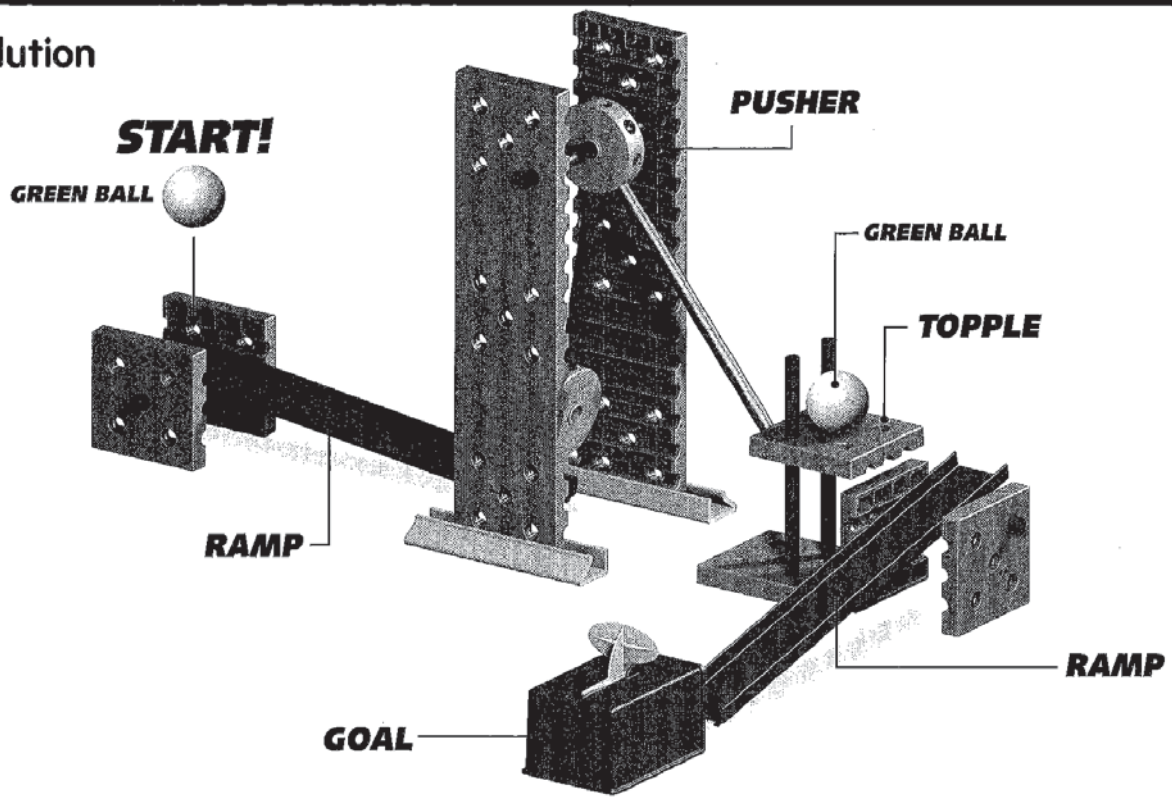
3




-3465
Clinton-Macomb
Public Library

©Lakeshore

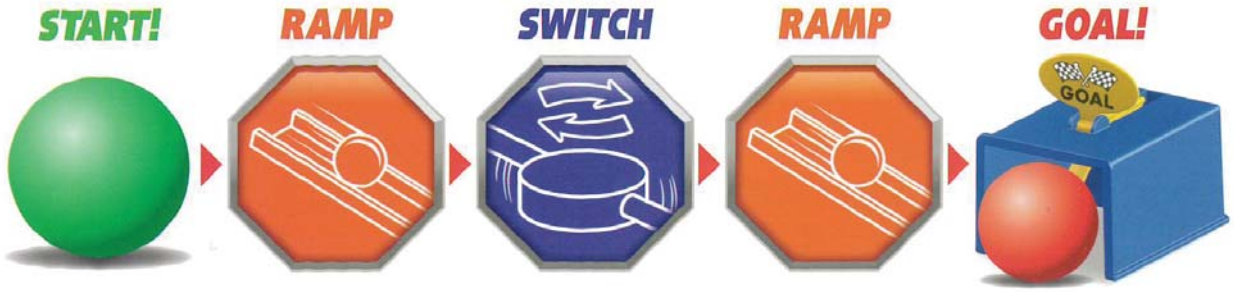
## Possible Solution



# USE 3 CONTRAPTIONS

to get a red ball into the goal.

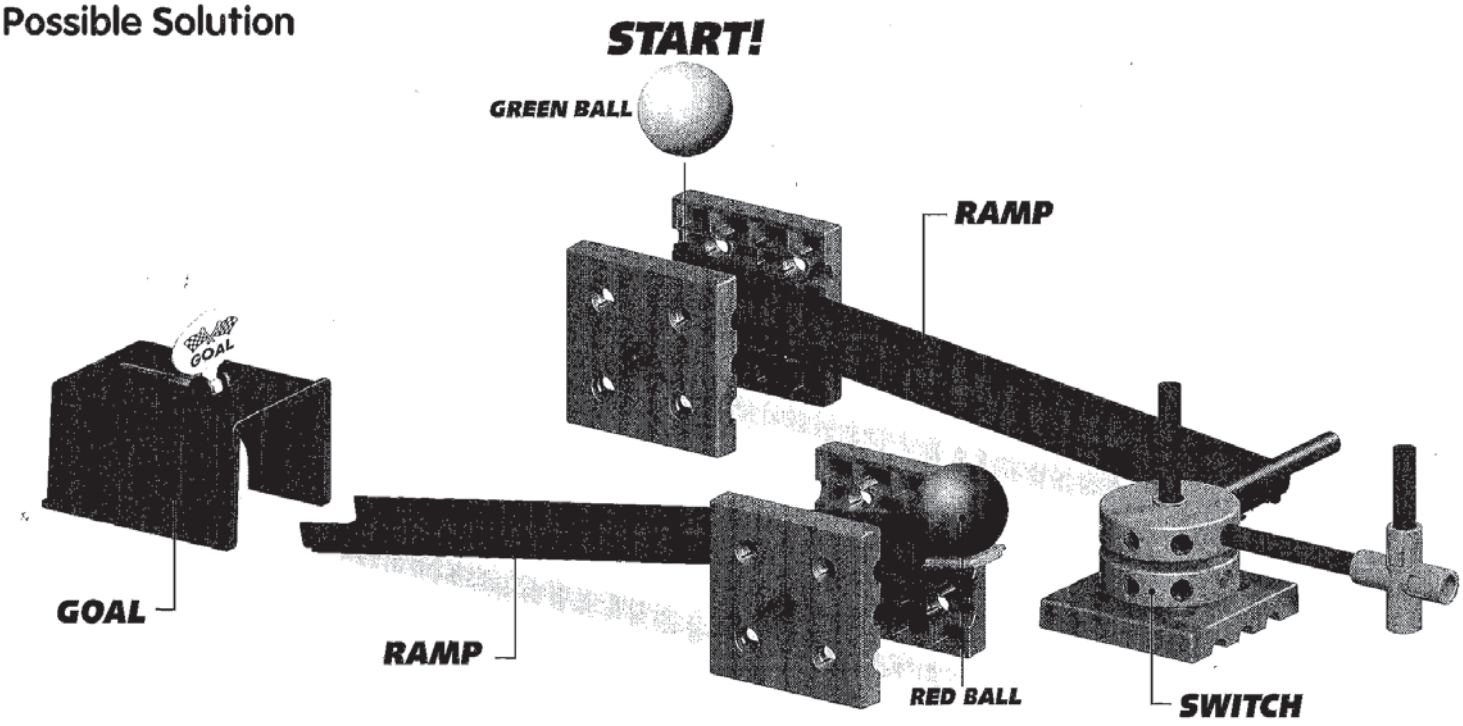
2




3466
Clinton-Macomb
Public Library

©Lakeshore

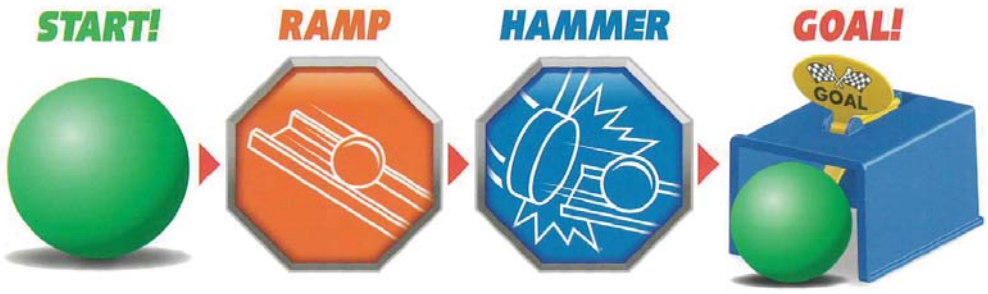
## Possible Solution



# USE 2 CONTRAPTIONS

to get a green ball into the goal.

1




3405
Clinton-Macomb
Public Library

©Lakeshore

## Possible Solution