

# Chain Reactions

## Best for Ages

6+

## Workspace

Indoor area

## Is electricity required?

No

## Description

Rube Goldberg was an inventor who developed machines that were built to do simple tasks in a complicated way. These machines are chain reactions which is a sequence of objects moving to trigger the motion of another object. This activity explores the cause and effect nature of chain reactions as you become an inventor to make your own machine!

## Materials

- Items to build with and give height: cardboard tubes, PVC pipes, scrap wood pieces, cardboard, plastic toy car track
- Tools: clamps, scissors, tape, hot glue
- Objects that roll or move: marble, tennis ball, golf ball, wheeled toys, toy cars, kinetic toys, dominoes
- Fun items: flyswatter, ping pong paddle, musical toys, jingle bells, funnel, boot, DVD/VHS cases, books, pinwheel, any unusual item
- Decorative items: pipe cleaners, googly eyes, feathers, markers

## Concepts Explored

- Cause and Effect
- Momentum

## What to Do

1. Gather all your materials. Unusual objects often inspire creativity! Watch this [video](#) to get some ideas.
2. Use the building items to start creating the chain reaction. Begin with an input action that will start the reaction. What motion will launch the reaction? How are you going to give your rolling object momentum to trigger the next step?
3. Continue to build your chain reaction in pieces with each step being triggered by the last. For example, your books could be knocked over in line and push a toy car forward that triggers a ball that knocks over a bottle of water. Introduce new objects or types of motion with each step.
4. Consider adding height to your reaction. How can you use your materials to add vertical motion or build above/below your work surface.
5. Your chain can end however you would like. Perhaps a ball falls in a basket or a fan turns on to blow around colorful balloons.



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## Troubleshooting Tips

- Patience is required when building chain reactions since actions likely won't work exactly as you expect them to on the first try. Repeatedly modify your chain until it works!
- Test each section often as you build. Based on the results, make changes and test it again.
- If your items won't stay in place, try taping one side to the flat surface. This will also help you reset more quickly after testing.
- Need a ramp? Try cutting a cardboard box into two strips to then tape/glue to the base as railing.



Would it take more force to knock over a heavier book than a lighter one?

Does changing the slope of the ramp affect the speed of your ball?

If you change to a surface like carpet, do your objects move differently?

## What is Happening?

- **Momentum** is mass in motion. All of your objects have mass, so as they are moving they have momentum that keeps them moving forward.
- Chain reactions depend upon **cause and effect**, which is the relationship between events. One event is the result of the other event. It's a combination of action and reaction.

## Taking it Forward

- **If you like this activity, you'll also like:**
  - [Build a Bridge](#)
  - [Bernoulli Obstacle Course](#)
- **Connecting this activity to the real world:**
  - Participate in the [Bar of Soap Rube Goldberg national challenge](#)