RAFT IDEAS

Topics: Forces, Motion, Gravity, Potential and Kinetic Energy

Materials List

- ✓ Large diameter bindery combs with wide spines
- ✓ Marbles
- ✓ Tape
- ✓ Objects to put ramps on (cardboard boxes, pieces of foam, chairs)
- ✓ Optional: pipette tips or craft sticks
- ✓ Optional: Matte or foam board

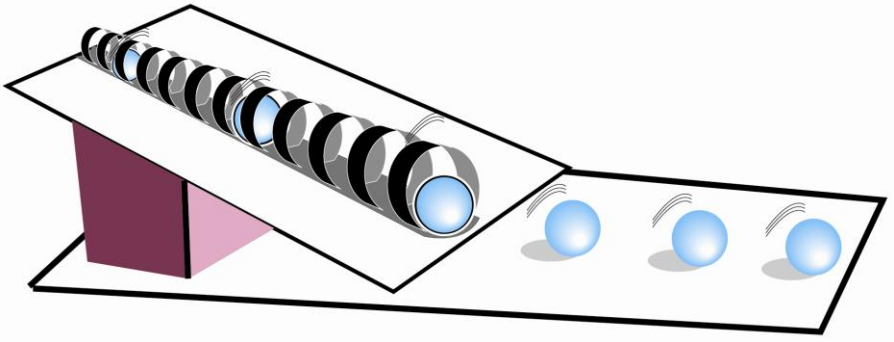
This activity can be used to teach:

- Forces & Motion (Next Generation Science Standards: Grade 3, Physical Science 2-1, 2-2; Middle School, Physical Science 2-2; High School, Physical Science 2-1)
- Gravity (Next Generation Science Standards: Grade 5, Physical Science 2-1)

raft resource area for teaching www.raft.net

Bindery Comb Rolling Ramps

Let the good times roll!



Teach bindery combs new tricks in this hands-on exploration of forces and motion!

To Do and Notice

1. Start by rolling a marble down the inside of the spine of a bindery comb. Push two bindery combs together end-to-end to make a longer ramp section and tape the combs together. Roll a marble through the double-length section.
2. Make a series of interconnected ramps by taping the combs to desks, tables, blocks of foam, or boxes. Challenge students to include numerous level and directional changes in their rolling ramps. If taping combs to walls, test an area first to be sure that the tape will not damage wall surfaces.
3. **Optional:** construct permanent ramps by taping or gluing the combs to matte or foam board. Pipette tips and craft sticks make excellent track supports when pushed into or glued onto foam board. Tape or glue the combs to the track supports.

The Science Behind the Activity

Gravity is an attractive force that exists between all forms of matter. The Earth's gravitational field, resulting from its large mass (about 6×10^{24} kilograms), is the dominating force for objects near its surface. If a marble is on a sloped surface, Earth's gravity will pull the object closer by rolling the marble down the sloped surface. As the marble falls or rolls down a slope, **gravitational potential energy** is converted into **kinetic** (moving) **energy**. Galileo experimented with balls rolling down inclined planes to discover the mathematics of falling objects due to gravity.

Taking it Further

- Use a stopwatch to measure the time it takes for marbles to roll down a ramp inclined at various angles. Log the data and graph the results.
- Have students write in a journal about the various ways that ramps are used in our society. What engineering challenges do ramps help solve? Have students research the reasons why ramps (**inclined planes**) make work easier.
- Devise ways to trigger the marbles to roll down the ramps remotely. Incorporate bindery comb ramps as part of larger mechanical contraptions (often called a "Rube Goldberg Device").

Web Resources - (Visit www.raft.net/raft-idea?isid=304 for more resources!)

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