

RAFT IDEAS

Topics: Observation, Experimentation, Topology

Materials List

- ✓ Metal bead chain (lamp chain), 2-1/2 mm (3/32") diameter about 1 m (1 yd) long or thin rope
- ✓ Connector for metal bead chain, if needed
- ✓ Metal ring that is between 5 cm (2") to 10 cm (4") in diameter (solid, loose leaf ring, binder ring or equal)

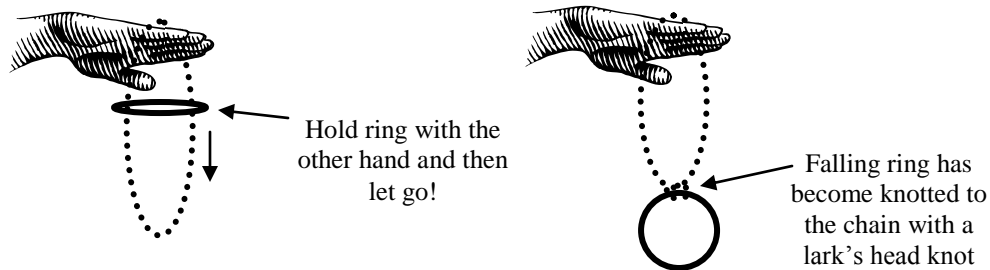
This activity can be used to teach:

- Problem Solving and Reasoning (Common Core Math Standards: Mathematical Practices Grades 4 -7)
- Science & Engineering Practices (Next Generation Science Standards: Grades 4-12)



Catch a Falling Ring

How does a falling metal ring become knotted to a chain loop?



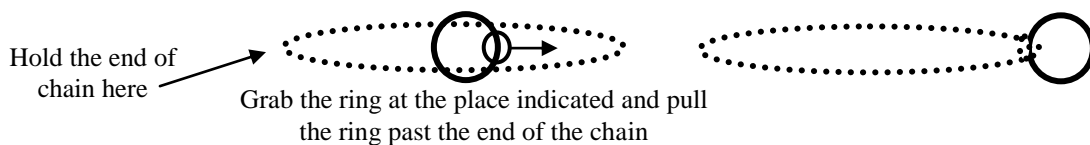
Strengthen observational skills, build persistence, and provide the joy of discovery as students work to find a way to cause a falling ring to end up tied to a loop of chain.

Assembly

1. Cut a 1 meter (~1 yard) or so length of metal bead chain or of thin rope that is very flexible and will hang straight down when held as a loop.
2. Form the chain or rope into a loop by using a metal connector or by tying a knot.

To Do and Notice

1. Use the non-dominant hand to hold the chain, or rope, to form a loop with the connector or knot at the top of the loop. The loop should have a width about equal to the inside diameter of the metal ring. See the top left illustration.
2. Pick up and hold the ring, parallel to the floor, between the thumb and pointer or middle finger of the other hand. Move the ring under and up the chain so that the loop of chain is inside the ring. See the illustration at the top left of the page.
3. Let go of the ring. Does the ring fall to the floor or become knotted to the chain?
4. If the ring is knotted to the chain then unknott the ring and repeat the steps.
5. If the ring is not knotted what would have to happen for the ring to become knotted to the chain? Do the following steps, as illustrated, to help find a solution.
6. On a flat surface run the chain loop **through** the ring. Hold an end of the loop and grab the ring at a point between the chain loop and pull the ring down the chain.



7. If the ring does not become knotted then place the chain through the ring **exactly** as before, hold the other end of the chain, and move the ring in the opposite direction.
8. How can the motion of the ring, identified in step 6 or 7, be recreated when the chain is held vertically (step 1)? Repeated observations and trials will be needed.

The Science Behind the Activity

Observation is a key scientific and life skill. Persistence is developed as students test different possible ways to make the falling ring rotate so as to become tied to the chain. Students will experience the satisfaction and joy of discovery if allowed to persist until a solution is discovered, rather than being shown a solution.

Web Resources (Visit www.raft.net/raft-idea?isid=547 for more resources!)

- Larks head knot - http://www.ehow.com/how_13480_make-larks-head.html
- Puzzle video - http://www.metacafe.com/watch/1055661/chain_and_ring_trick/
- Puzzle & a solution video - <http://www.youtube.com/watch?v=QUCXm1CrUUg>