

RAFT IDEAS

Topics: Physics, Forces, Newton's Laws, Motion, Inertia

Materials List

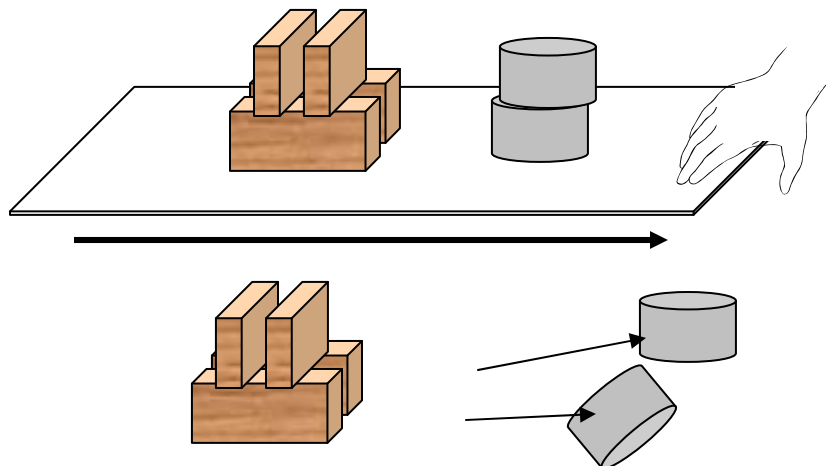
- ✓ A slick tablecloth, plastic sheet or equivalent, at least 30 cm x 45 cm (12" x 18")
- ✓ Cassette tapes, blocks, or other similarly weighted objects
- ✓ Foam pieces or other light objects

This activity can be used to teach:

- Balanced and unbalanced forces (CA Science Standards: Grade 8, 2.a – 2.f)
- Newton's Laws (CA Science Standards: HS Physics, 1.b – 1.d)

The Old Tablecloth Trick

It's Really Not Magic; It's a Physics Demonstration!



Ever see a magician pull out a tablecloth from under dishes? This wonderful demonstration of inertia (not magic) will be a sure-fire “hit”!

To Do and Notice

1. Place the tablecloth onto a smooth, flat surface.
2. Stack cassette tapes onto the tablecloth.
3. Use a fast, horizontal pulling motion to **QUICKLY pull the tablecloth** from under the cassette tapes, and notice that they move very little and stay stacked. The key here is “QUICKLY”; it might require a little practice.
4. Repeat the activity using foam pieces. Notice that no matter how quickly the tablecloth is pulled, the foam pieces flip or fly from their original place.

The Science Behind the Activity

The key concept here is inertia, or resistance to change in motion. Mass is a measure of inertia, as shown in Newton's Second Law, $F=ma$; for a given force, the larger the mass, the smaller the acceleration, or change in motion. The pulled tablecloth applies a frictional force to the stack of cassettes above it and the stack accelerates; but the force is small and only occurs for a very short period of time. The slick tablecloth doesn't give the relatively massive stack of cassettes much acceleration before the tablecloth is pulled free. In contrast, the foam pieces always flip or fly off the pulled tablecloth. Since the foam pieces have less mass, they have less inertia. They also have higher friction surfaces, so the tablecloth gives the low mass, high friction foam pieces enough acceleration to send them flying!

Taking it Further

For other demonstrations of inertia, see the RAFT Idea Sheets: *Whack a Stack* and *A Hole in One*

Web Resources (Visit www.raft.net/more for how-to videos and more ideas!)

For more information on Newton's Laws, visit Hyperphysics at:
<http://hyperphysics.phy-astr.gsu.edu/hbase/newt.html#nt1>