

A linear accelerator for studying high-energy physics costs around \$5 billion. But you can make one for about 30 bucks with four strong magnets, a wooden ruler, some plastic tape, and nine steel balls.

This easy project demonstrates the transfer of kinetic energy from one object to another. More importantly, it also shoots a steel ball really fast at the target of your choice. When each ball strikes the magnet in front of it, its kinetic energy is transferred to the next ball down the line. By the time the fourth ball shoots off the ruler, it possesses almost four times the energy of the first ball, which means it's moving faster, too. (The speed increase is proportional to the square root of the increase in kinetic energy.) This project takes just a few minutes to build once you have the parts, which can be ordered from scitoys.com.

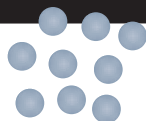
1 GET



One 12" wooden ruler with a groove running through it



Four gold-plated neodymium-iron-boron magnets



Nine 5/8" diameter nickel-plated steel balls

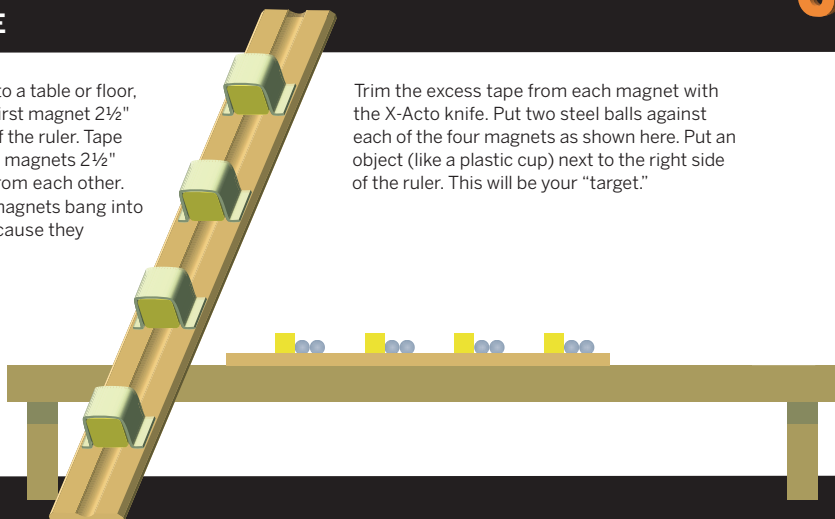


Scotch tape and an X-Acto knife

2 MAKE

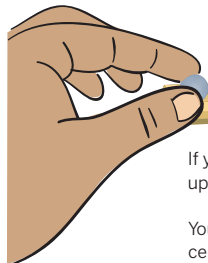
Tape the ruler to a table or floor, then tape the first magnet 2½" from the end of the ruler. Tape the other three magnets 2½" inches apart from each other. (Don't let the magnets bang into each other because they shatter easily).

Trim the excess tape from each magnet with the X-Acto knife. Put two steel balls against each of the four magnets as shown here. Put an object (like a plastic cup) next to the right side of the ruler. This will be your "target."



3 USE

Place a ball on the groove as shown. You might need to give it a gentle nudge. Once the ball hits the first magnet, the ensuing chain reaction will move too fast for you to see.



If you want to capture images of the rail gun in action, you can make a cheap high-speed camera set up like these guys did at web.mit.edu/Damonv/Public/Doombolt.

You can build a more powerful rail gun with a longer ruler and more magnets and balls, but at a certain point, the magnets will start to shatter.

