



# SUPER POWER: Elastic Potential Energy!

## SUPERHERO THROWING MACHINE

LAB NOTES...

BUILD TIME  
**15**  
MINS

### YOU WILL NEED

- Thick cardboard.....○
- 3 x Wooden skewers.....○
- Plastic bottle top .....○  
(e.g. from a milk bottle)
- Blue tack .....○
- Scissors .....○
- Pencil .....○
- Ruler.....○
- Tape.....○
- Elastic band .....○
- Small scrap of paper or foil.....○

### TO MAKE YOUR SUPERHERO THROWING MACHINE...

1. Watch Nanogirl making her superhero throwing machine.
2. Measure and draw a 32 cm long and 17 cm wide rectangle on stiff card, then cut it out.
3. Divide the rectangle into 3 parts by measuring and making a mark every 10 cm along the long edge, leaving a 2 cm tab at the end.
4. Draw vertically down from each of the marks and score each line with a scissor blade.
5. Fold outwards to form a pyramid shape and tape at the tab.
6. Stand the pyramid up on its triangle end and write "top" at the top of the shape and "front" on the face opposite the tab.
7. On each of the side faces measure 2 cm in from the fold, and 1 cm down from the top, and make a mark. Use the skewer to make a hole at each mark.
8. Make another set of holes which are 2 cm from the front edge and 3 cm up from the base.
9. Measure 8cm down from the top of the back corner, then 5 cm along each side. Draw lines to connect these points then up to the top, then cut this rectangular shape out.
10. Cut two thin strips of card 2 cm wide and 5 cm long. Lay out two skewers and place the two strips between them, one at the bottom and one about half-way up. Tape them in place.
11. Make a small paper straw to act as a bearing by rolling a narrow strip of paper around a skewer then taping the tube.
12. Tape this tube across the two skewers 1.5 cm in from the bottom edge, so that it's over one card strip and trim the edges.
13. Use blue tack to secure a bottle cap to a square of card, then tape the card to the top end of the two skewers. This will be your catapult arm.
14. Cut a skewer half to make two shorter skewers. Thread one through the bottom hole on one side of your card triangle, through the tube bearing, and out the other side.
15. Thread the other half of the skewer through the top hole, through one elastic band and then out the other side.
16. Mark 2 cm down from the top in the centre of the front face and make a small hole.
17. Thread your elastic band through this hole, up over the top and stretch it over the back of the wooden skewer arm.
18. Make a projectile out of rolled paper or foil! Place it in the bottle cap, draw the arm back, and let it go!

### WHAT'S GOING ON?

When we stretch out an elastic band, we build up a supply of potential energy. When we release the elastic band, the potential energy is converted into kinetic energy or movement.

Adding the elastic band to store potential energy into a lever is another way to increase the power of the throw as well as changing the length of the lever arm. The projectile should follow a parabola shape in the air - this is where it will start going up initially but eventually gravity will pull it down to the ground.

### How far can you throw your projectile using the catapult?

Build a cardboard wall in front of the catapult. How high does your projectile go, and can you get it over the wall?

### What happens when you change the size or thickness of the elastic band?

What happens if you move the bottle top from the top of your skewers to the middle?