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Pantograph


Stem Activities



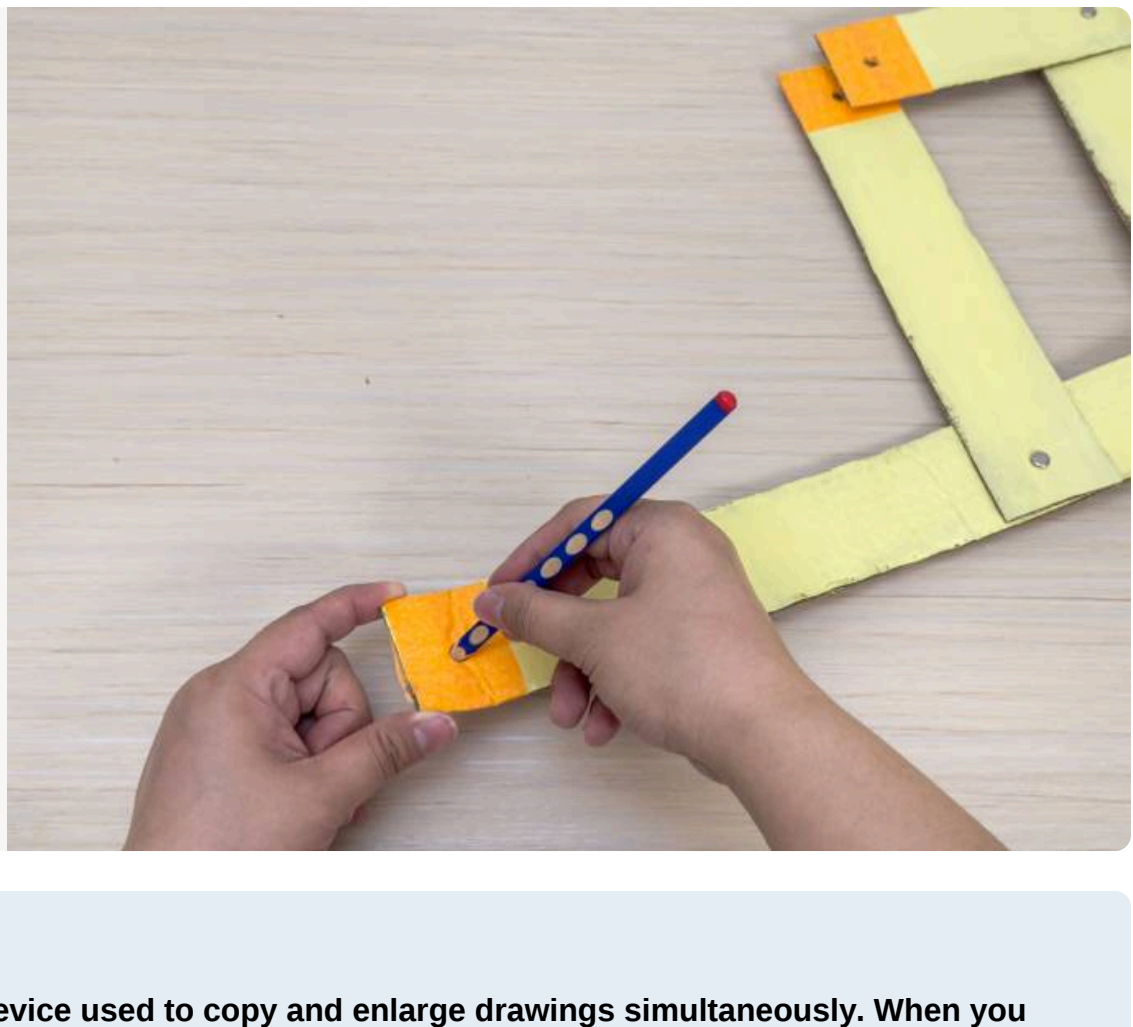
Ages: 6-8



Less than 30 minutes



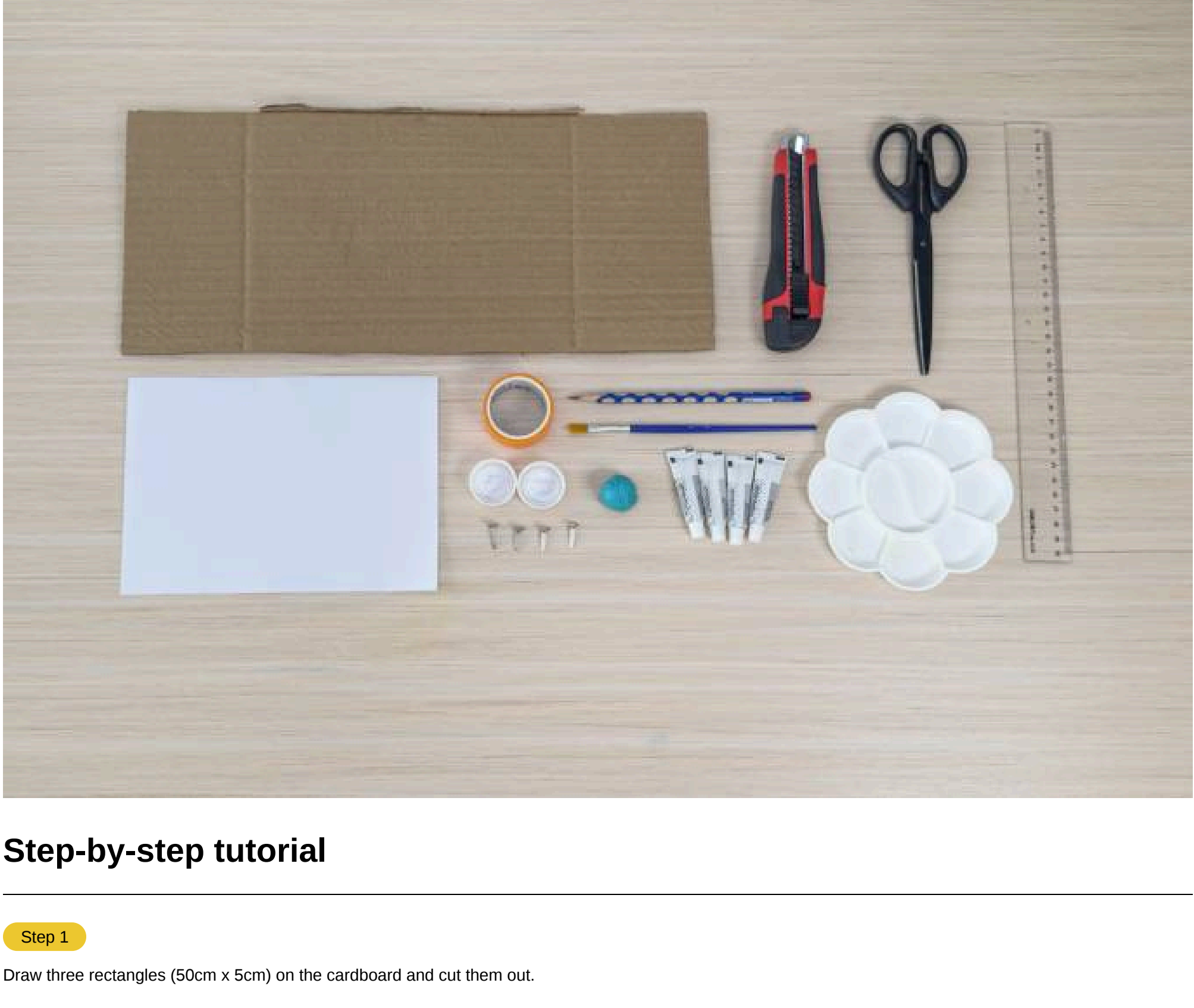
Grownup needed



The pantograph, invented over 400 years ago, was a device used to copy and enlarge drawings simultaneously. When you move the central pencil, the end of the right arm copies your hand movements but covers a greater distance. The effect is magical, as if an invisible hand is holding another pen and copying your movements. Try this fascinating drawing machine yourself!

Materials Needed

Marker pen
Blu-tack
Tape
Pencil
Paintbrush
Scissors
Two bottle caps
Paint
Four split pins
60cm x 20cm cardboard
Ruler
Paper



Step-by-step tutorial

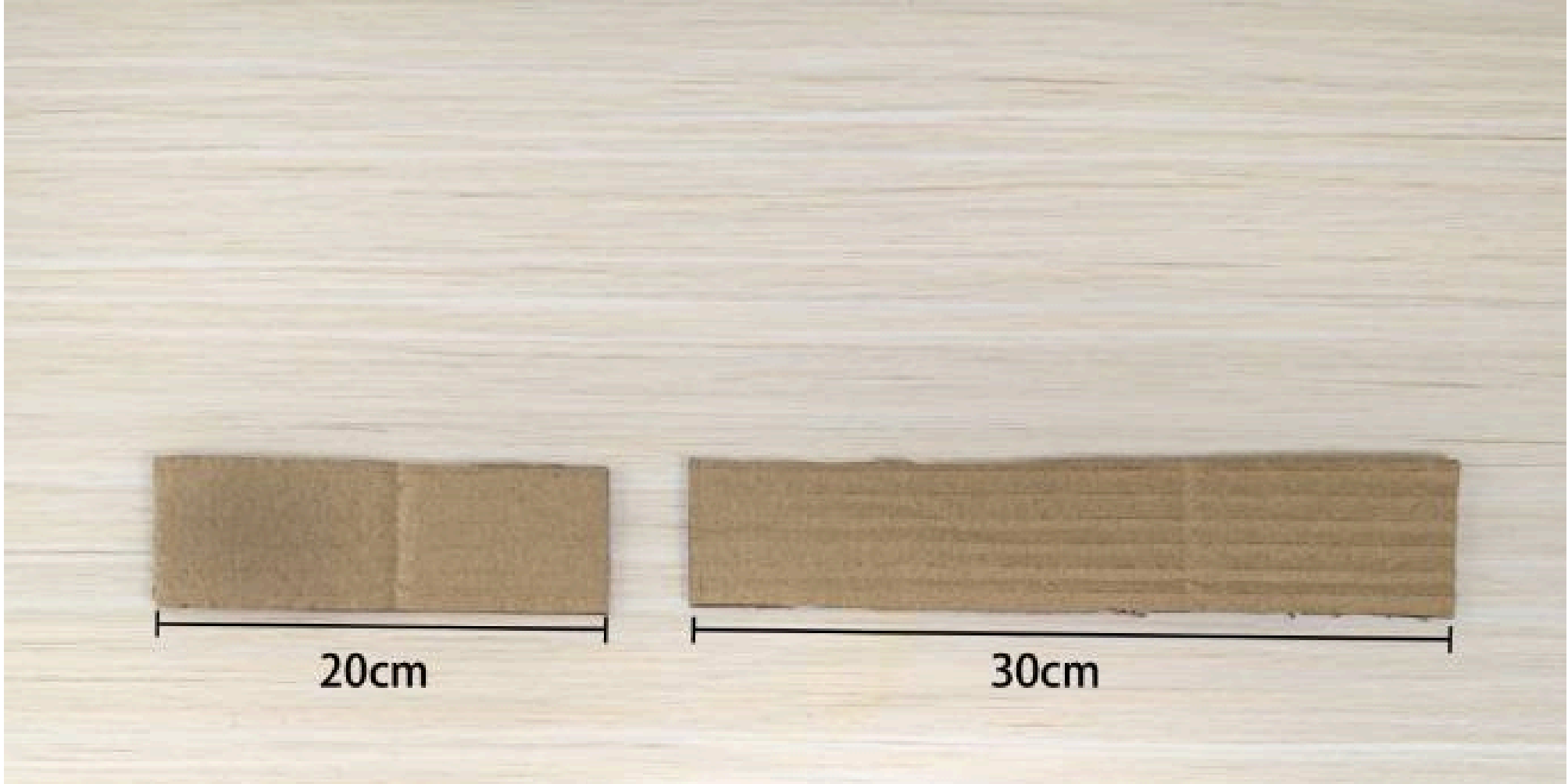
Step 1

Draw three rectangles (50cm x 5cm) on the cardboard and cut them out.



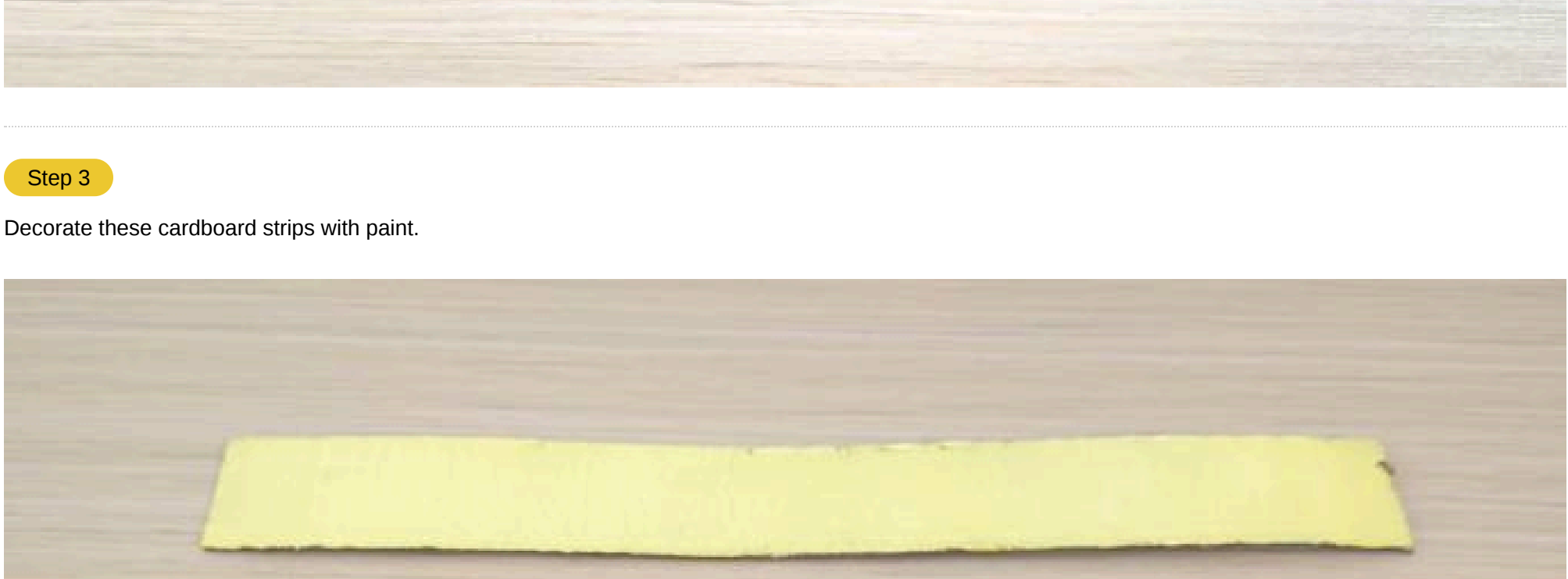
Step 2

Cut one of the rectangles at the 20cm mark to create two pieces - one 20cm long and one 30cm long.



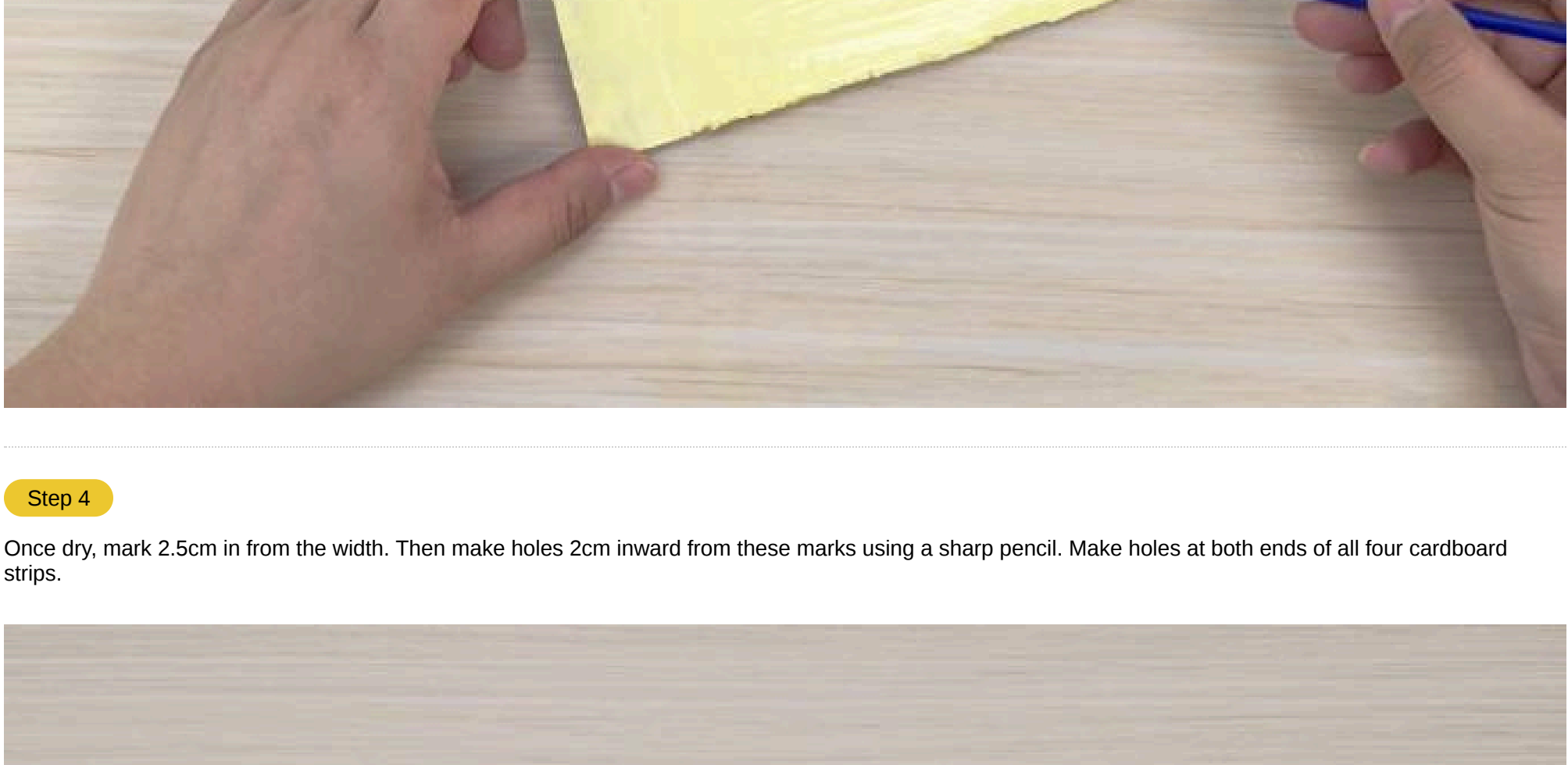
Step 3

Decorate these cardboard strips with paint.



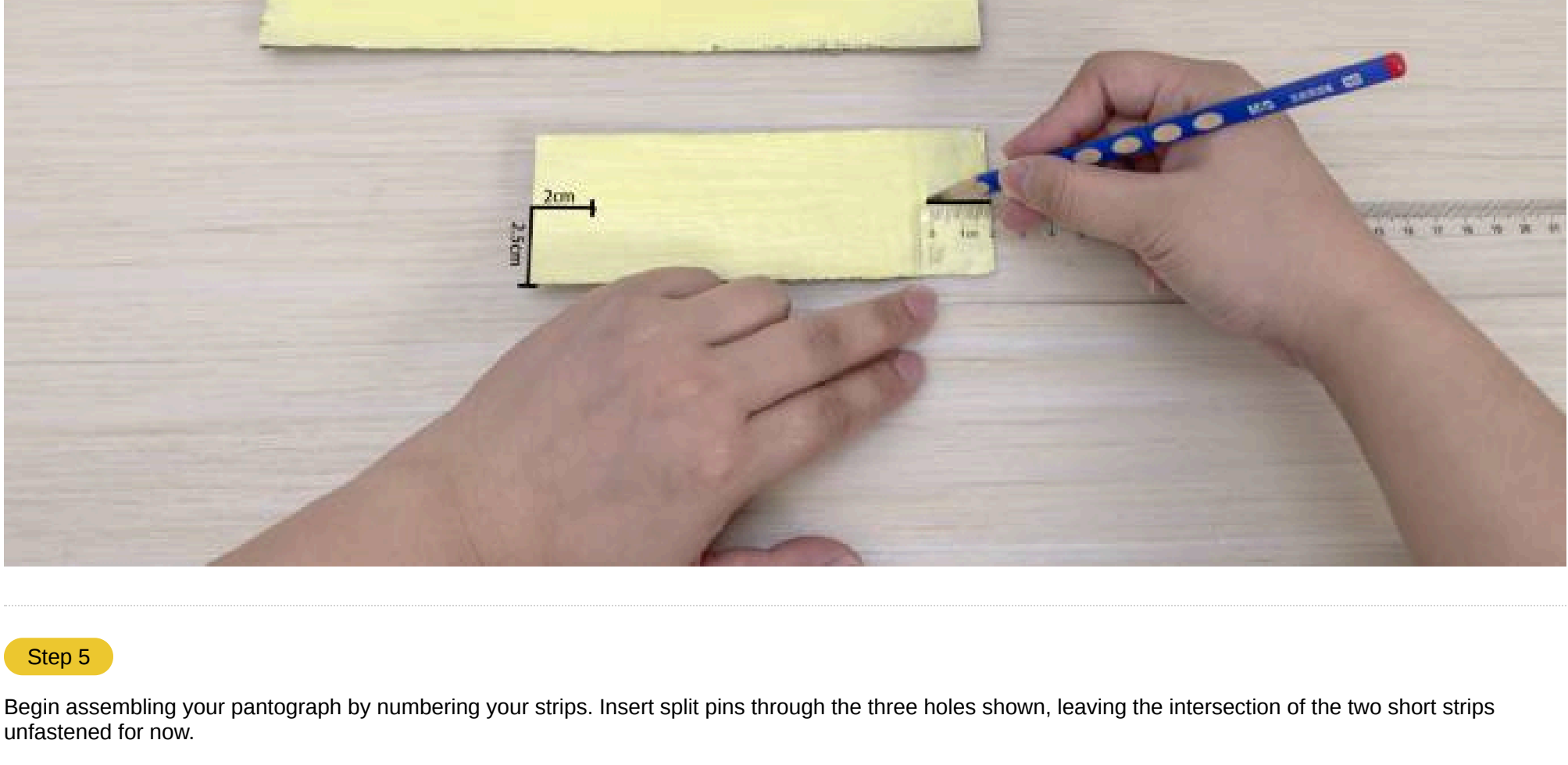
Step 4

Once dry, mark 2.5cm in from the width. Then make holes 2cm inward from these marks using a sharp pencil. Make holes at both ends of all four cardboard strips.



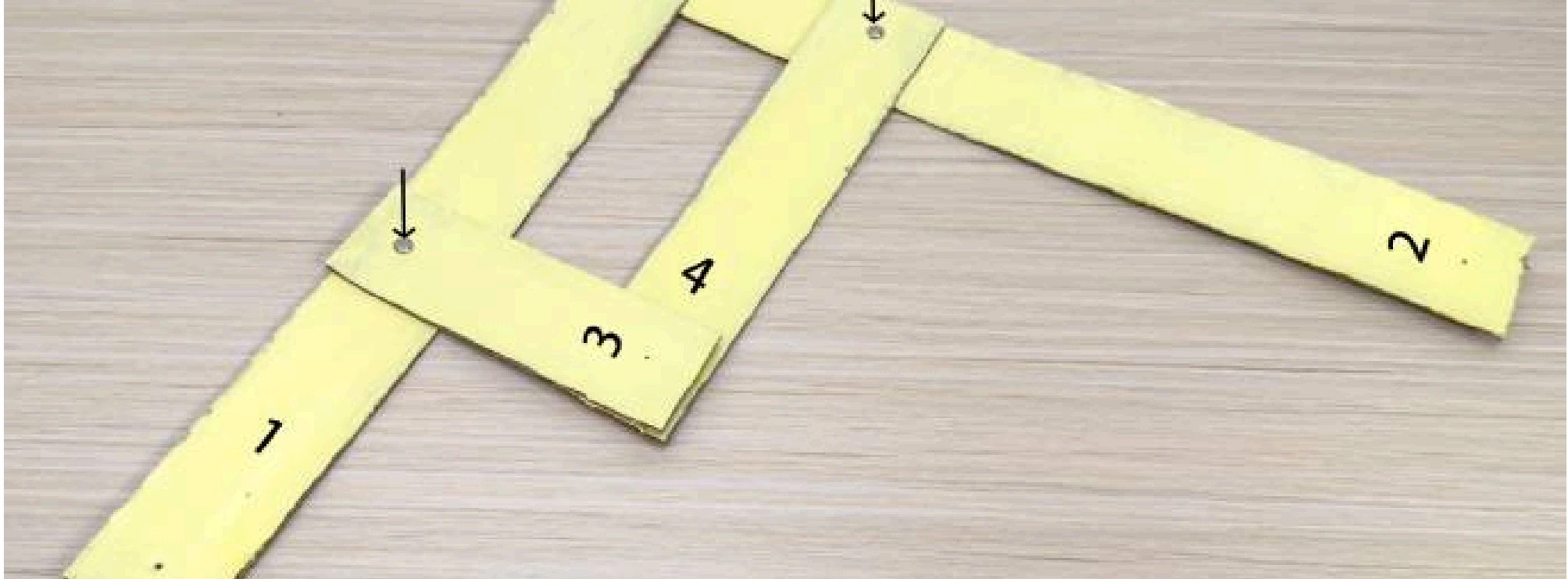
Step 5

Begin assembling your pantograph by numbering your strips. Insert split pins through the three holes shown, leaving the intersection of the two short strips unfastened for now.



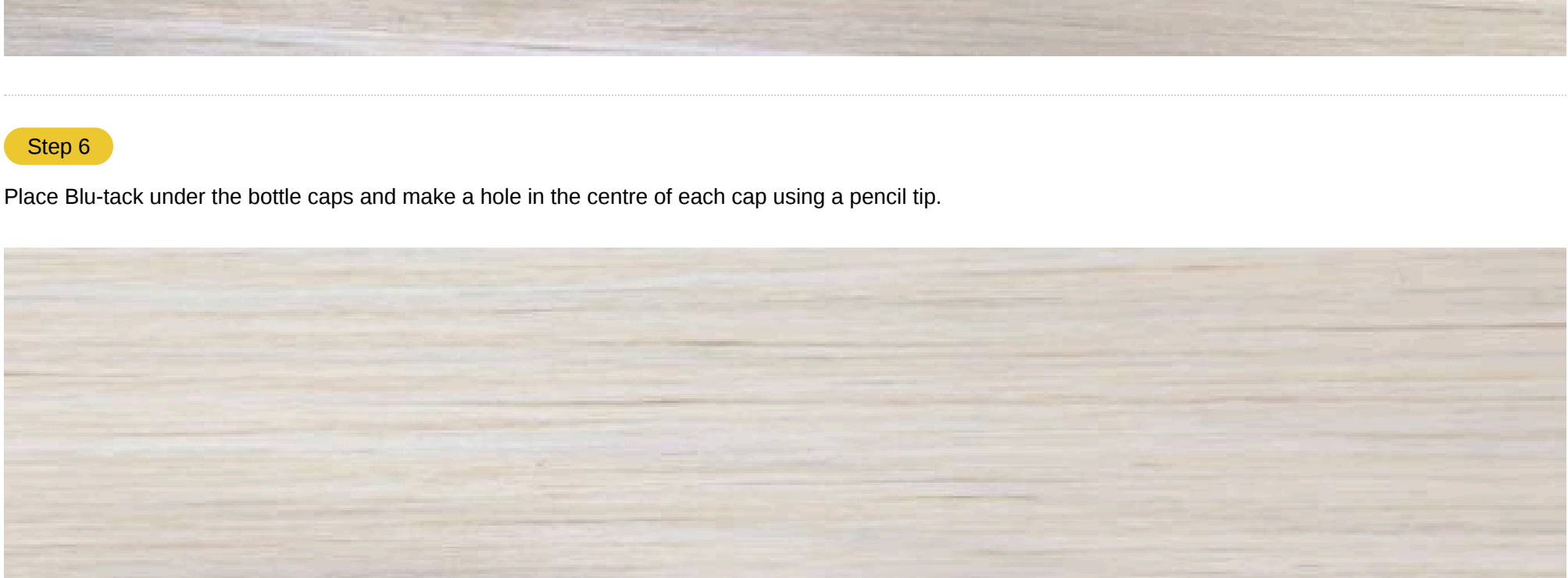
Step 6

Place Blu-tack under the bottle caps and make a hole in the centre of each cap using a pencil tip.



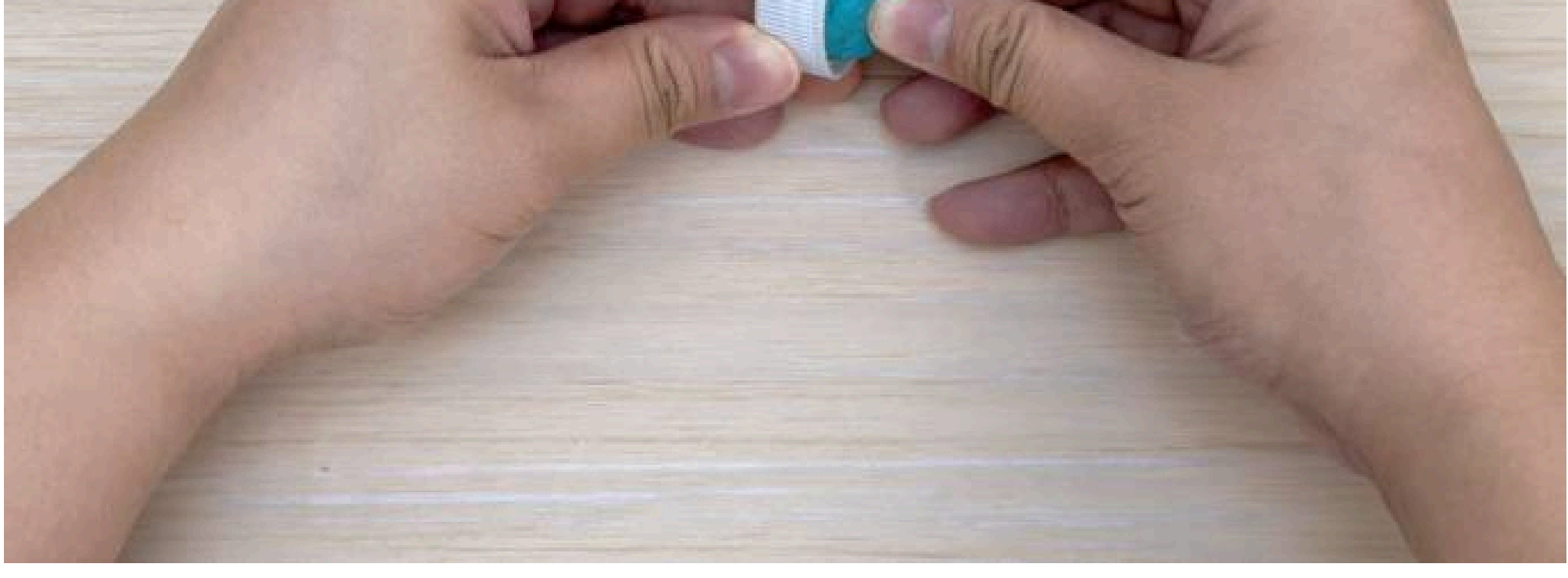
Step 7

Use a split pin to attach one bottle cap with Blu-tack to the end of strip 1, allowing it to be secured to the table.



Step 8

Attach the other bottle cap at the intersection of strips 1 and 2, removing the Blu-tack.



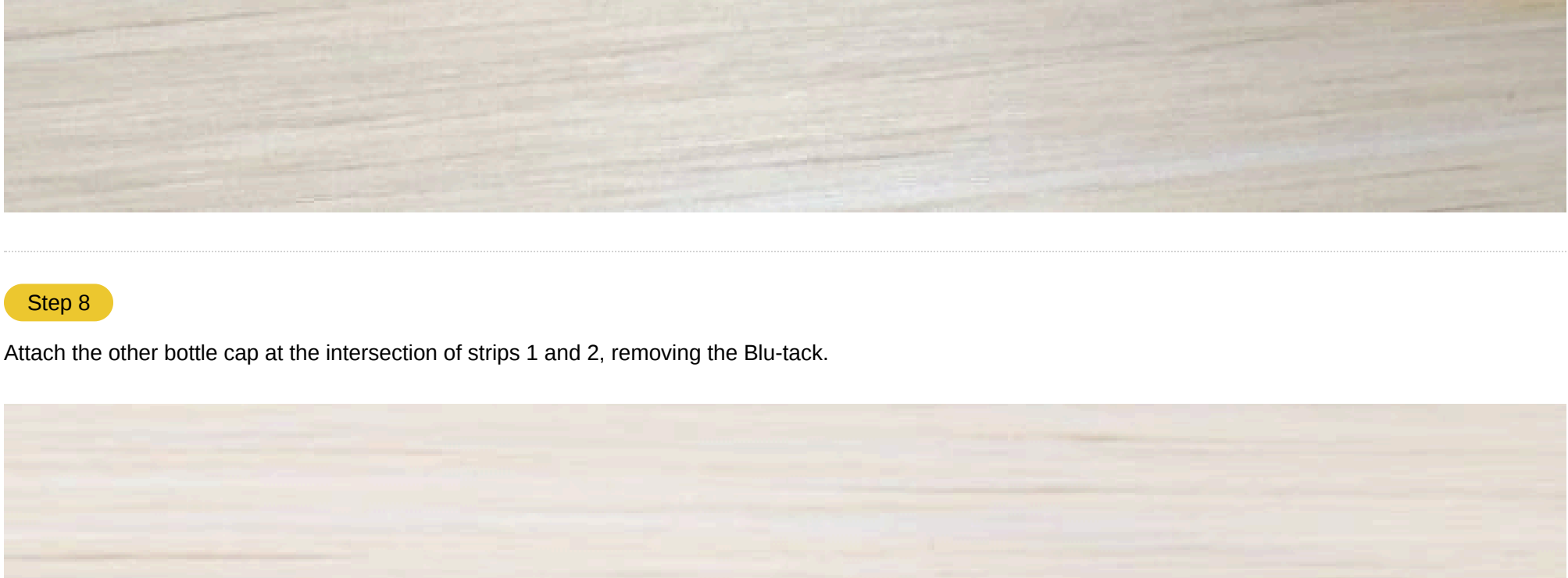
Step 9

Wrap tape around the free ends of both short strips and the right arm's end. This prevents the cardboard from splitting when the pens are inserted.



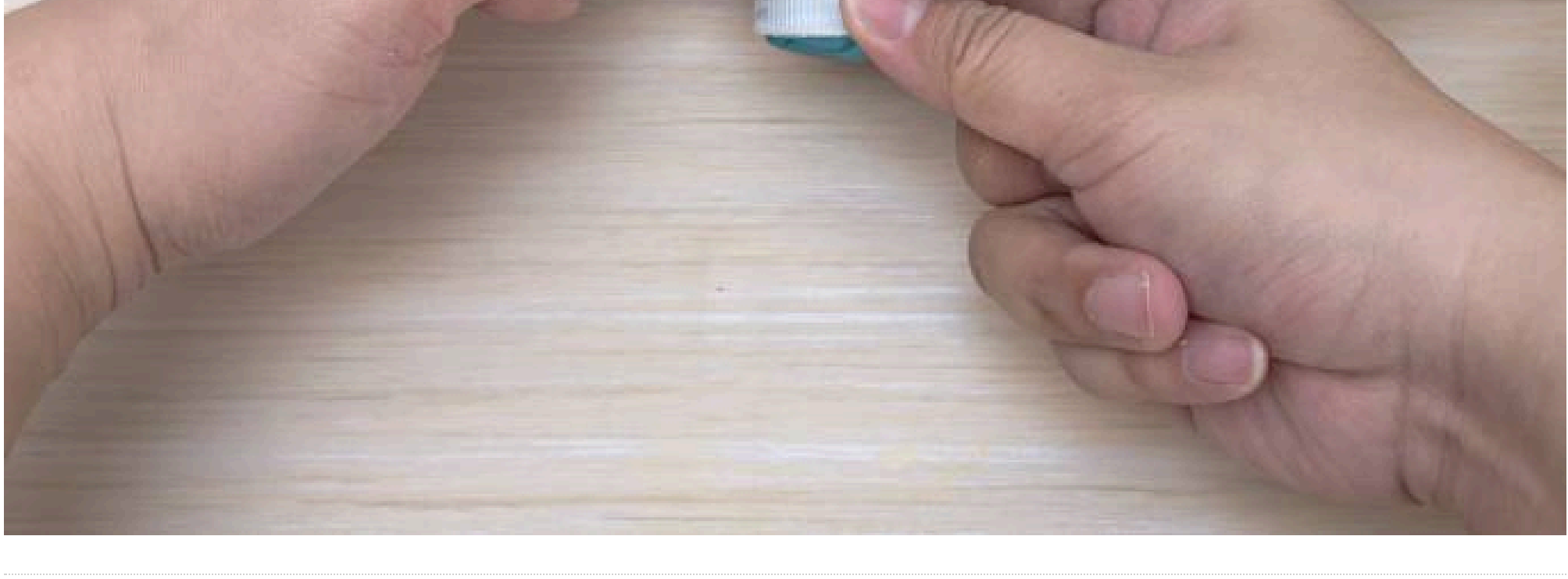
Step 10

Make holes through the taped areas using a pencil.



Step 11

Insert a pencil where the short strips intersect and a marker pen through the long strip. Your pantograph is complete - draw with the pencil and watch the marker pen create an enlarged copy!



The Science Behind It:

The pantograph's core is a parallelogram - a shape with parallel opposite sides (aligned in the same direction). The pencil and marker are fixed on parallel sections, so they trace identical shapes when moved. Since the marker is on the longer arm, it draws an enlarged version of the shape. The magnification factor equals the length of the marker's strip divided by the length of the pencil's strip (i.e., the length of strip 2 ÷ the length of strip 3).