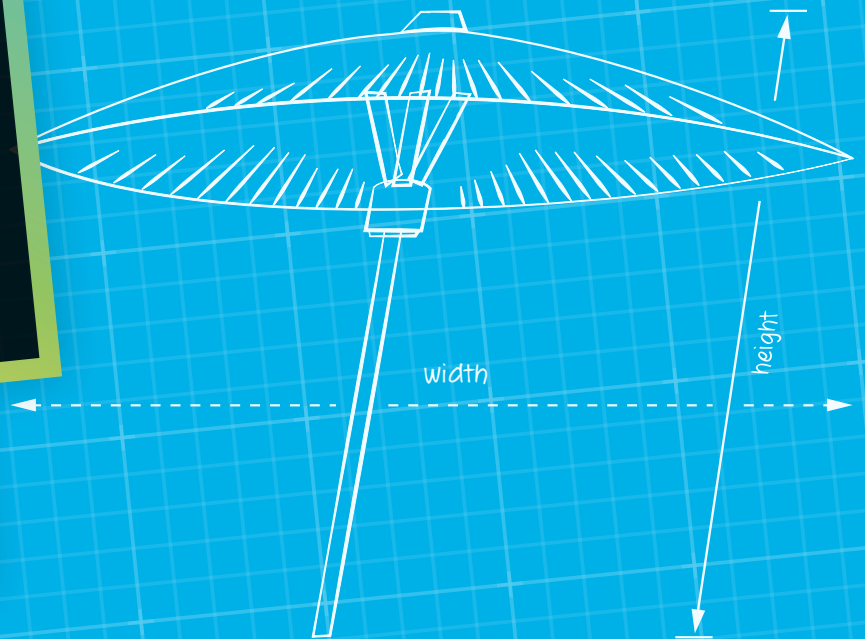




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DEPLOYABLE STRUCTURES

Group umbrella

This resource explains how to make a working umbrella mechanism out of coffee stirrers, cardboard and sticky tape. It uses basic practical skills and simple materials to create a clever deployable structure.

INSTRUCTIONS

You will require:

- 12 coffee stirrers (19cm long, 6mm wide and 2mm thick). These are available from www.plastico.co.uk
- Some card
- Some sticky tape
- A retractable craft knife and cutting mat (or other suitable equipment such as heavy duty scissors) to cut the coffee stirrers. **Read the safety notice below.**

Steps 1-24 create the basic unit of the mechanism. This basic unit needs to be made six times for each umbrella, so you could make them all if you are on your own or work as a group making one or more each.

Steps 25-31 show how to combine the basic units to create the completed mechanism.

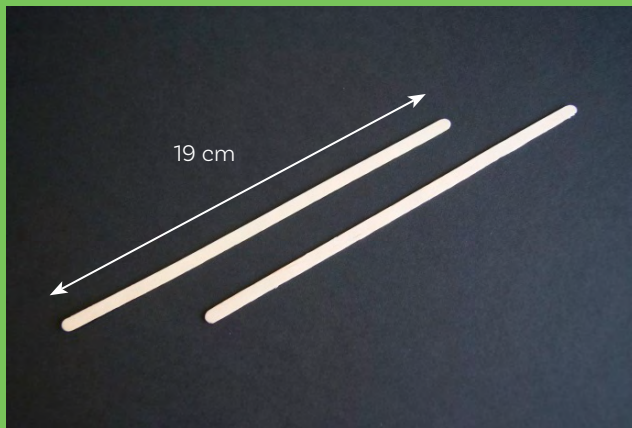
IMPORTANT SAFETY NOTICE

To make one of these umbrella mechanisms, 12 wooden coffee stirrers will need to be cut in two. This can be done with a craft knife and cutting mat or other suitable equipment. It is recommended that the teacher cuts the coffee stirrers before the activity begins in order to minimise the risk to students. Whether the teacher or the students cut the coffee stirrers, a **risk assessment** must be carried out to minimise risk or injury.

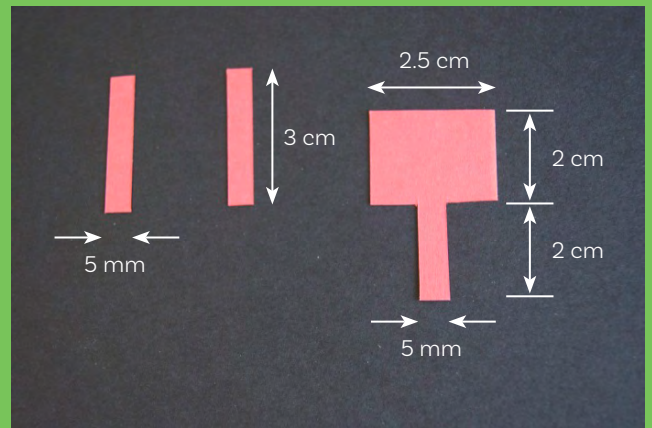


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Step 1

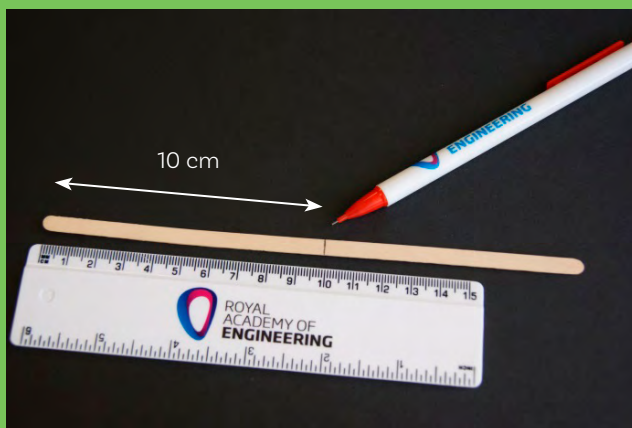


Step 2



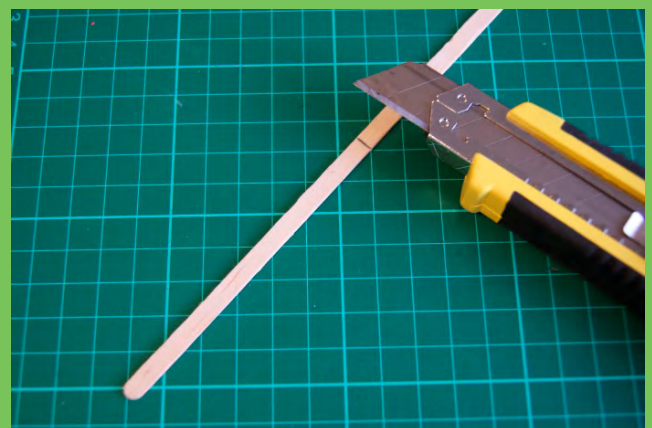
Mark out the shapes shown above onto card.
Cut the shapes out.

Step 3



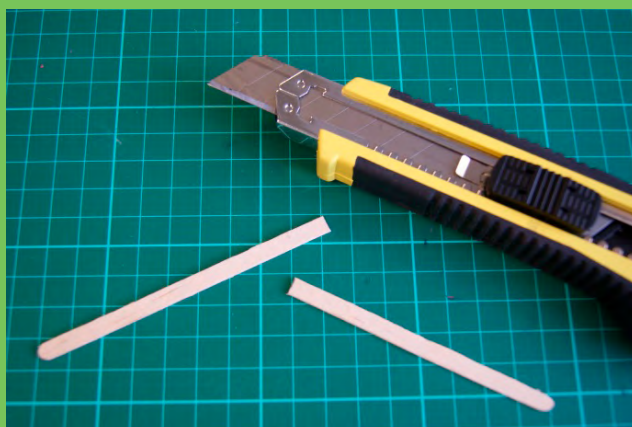
Draw a line across one of the sticks at 10cm.

Step 4

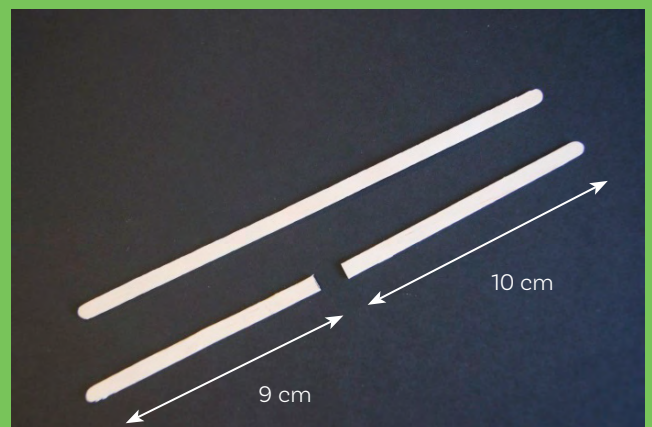


Read safety notice before proceeding with cutting the coffee stirrers.

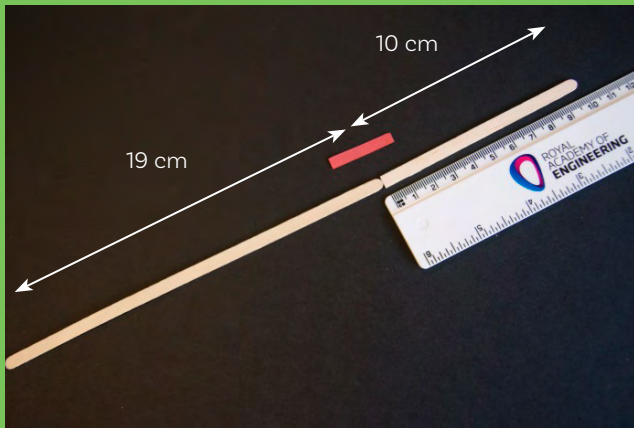
Step 5



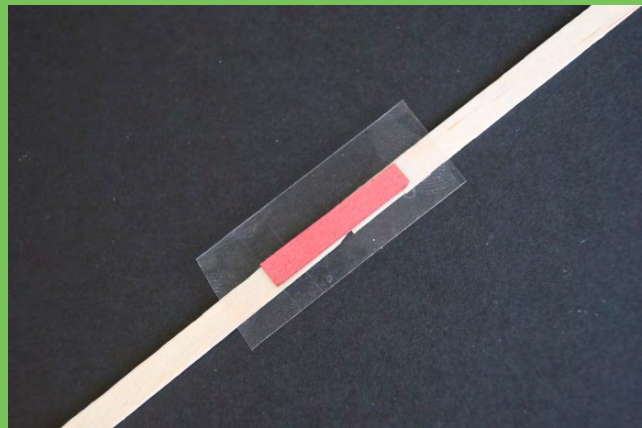
Step 6



Step 7



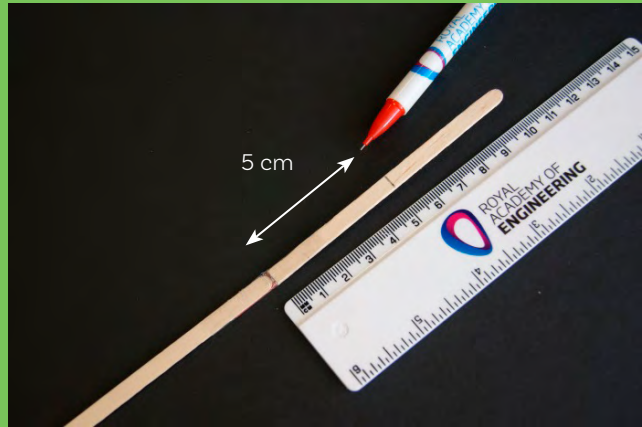
Step 8



Step 9



Step 10

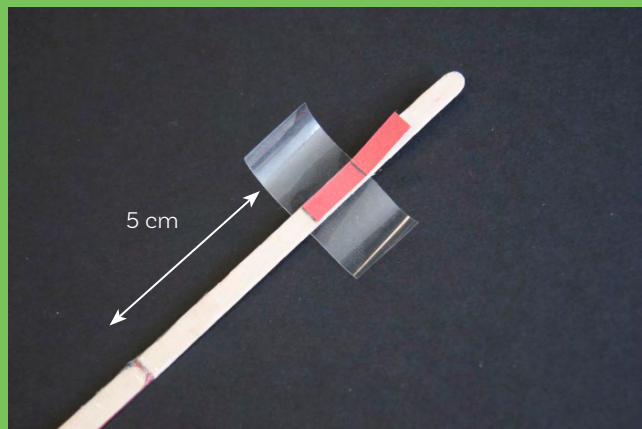


Make a mark on the 10cm length, half way along its length.

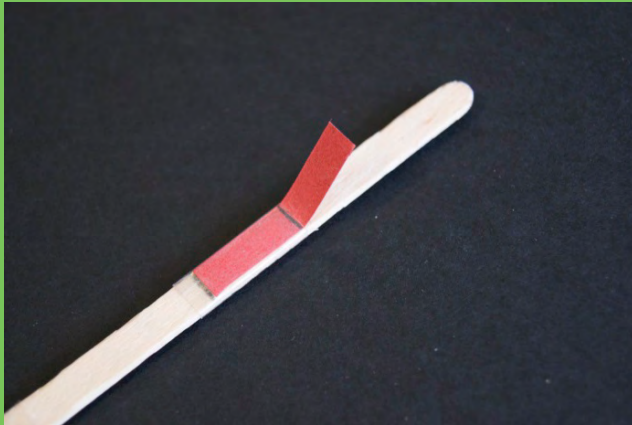
Step 11



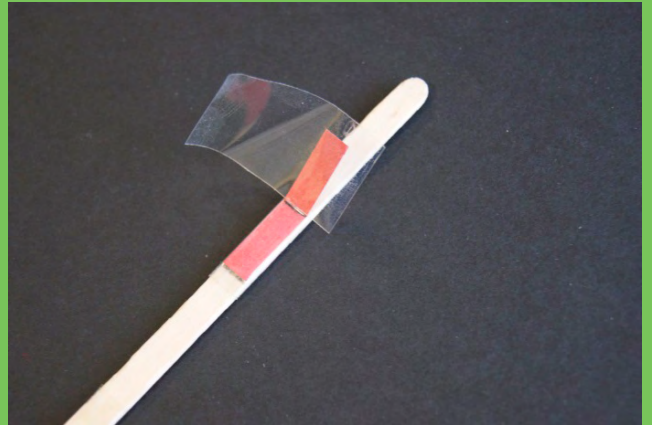
Step 12



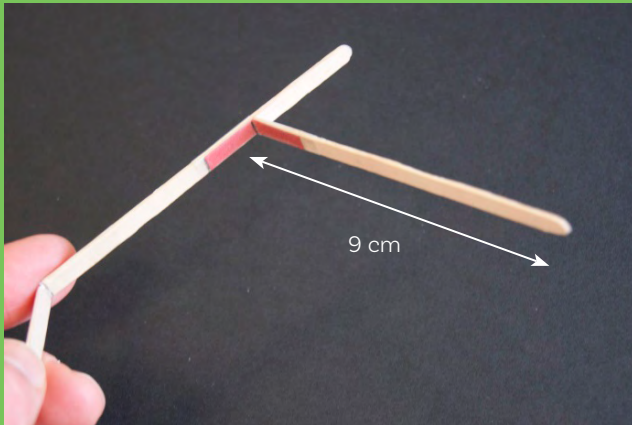
Step 13



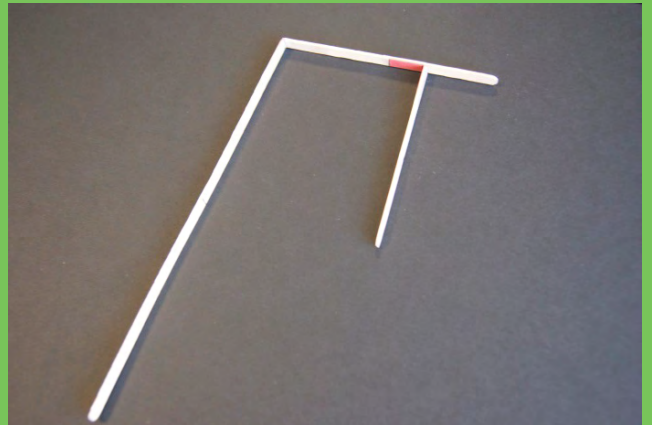
Step 14



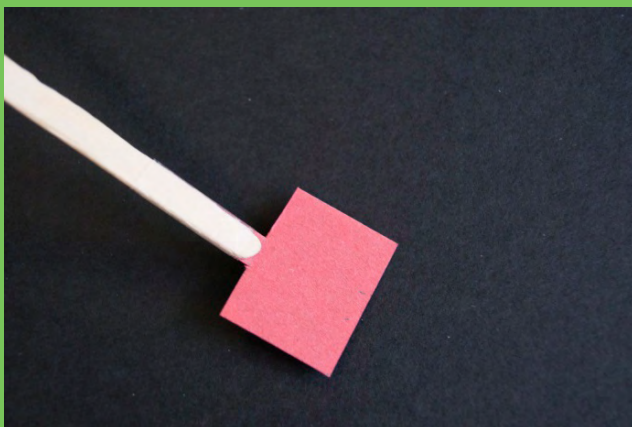
Step 15



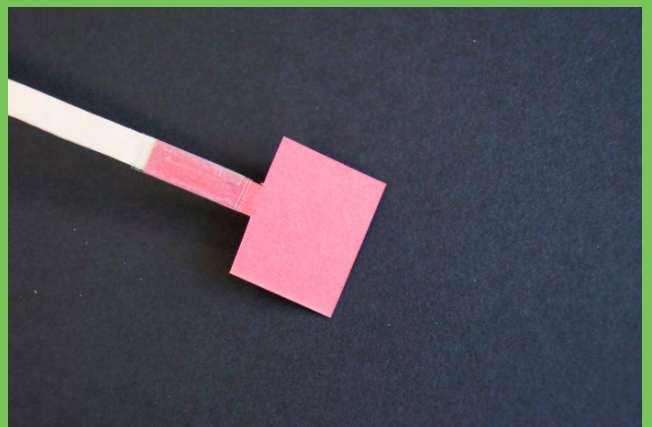
Step 16



Step 17

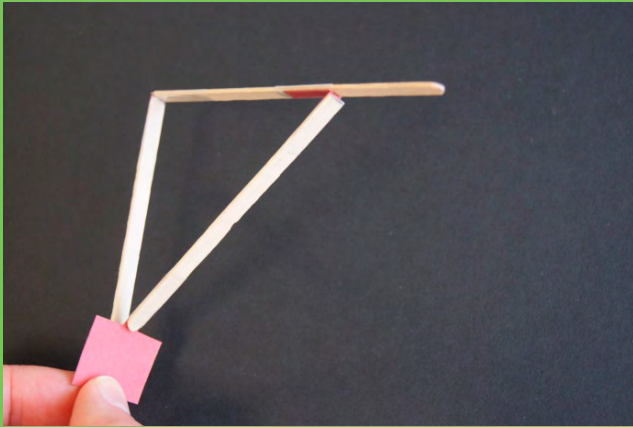


Step 18

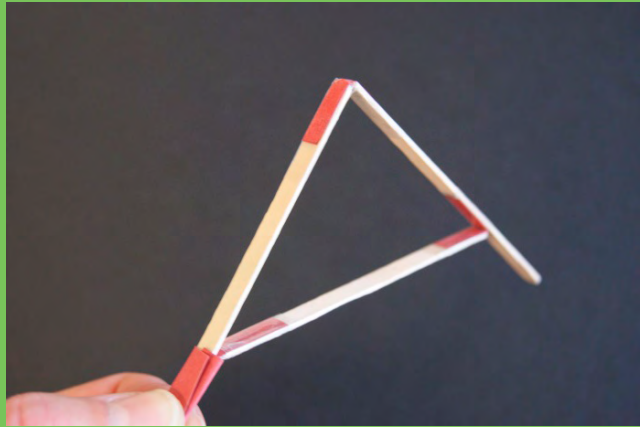


Attach the T-shape piece of card to the end of the 9cm length using sticky tape.

Step 19

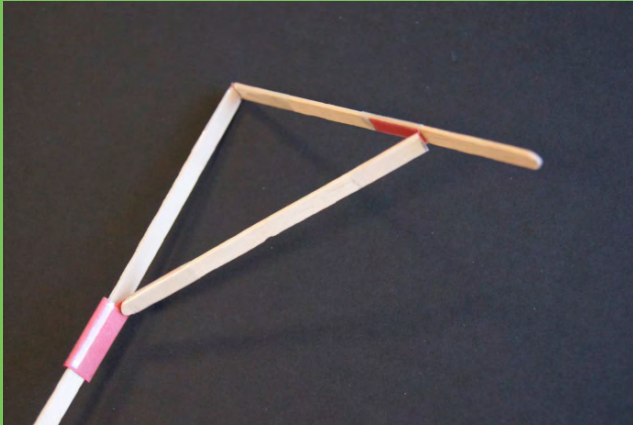


Step 20

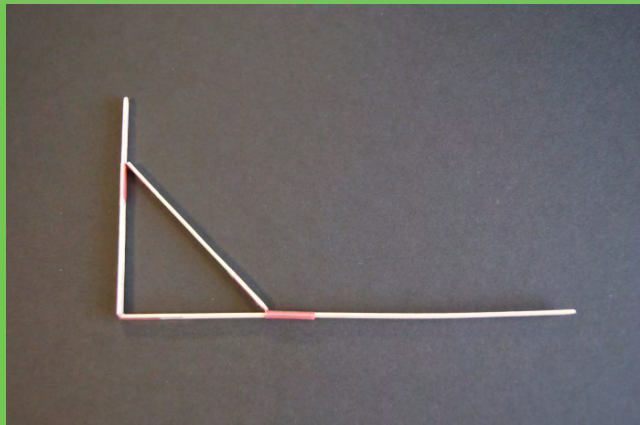


Fold the card around the 19cm length and secure with sticky tape.

Step 21

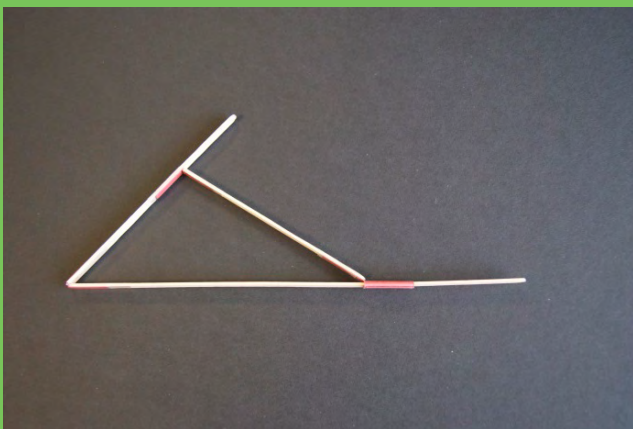


Step 22



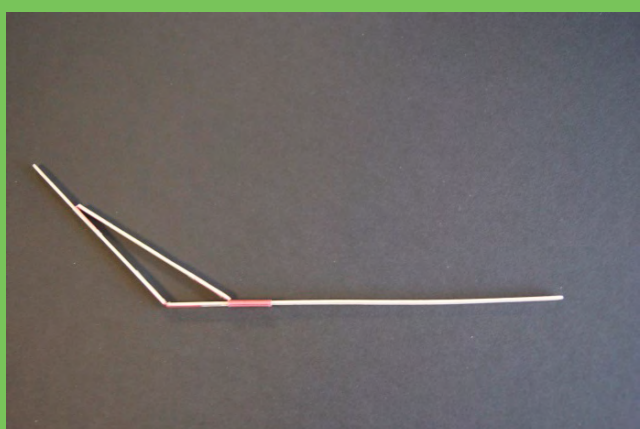
This completes one copy of the basic unit of the mechanism.

Step 23



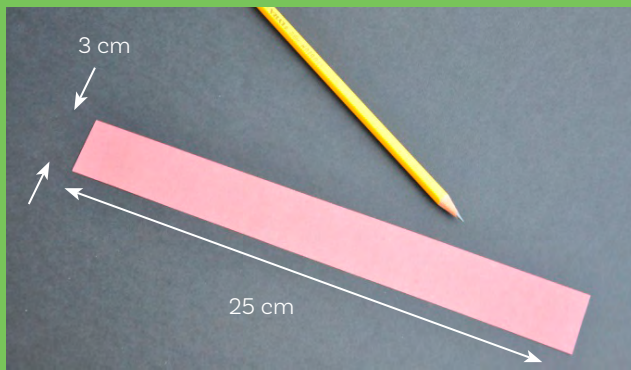
This unit should be able to move up as pictured in steps 23 and 24.

Step 24

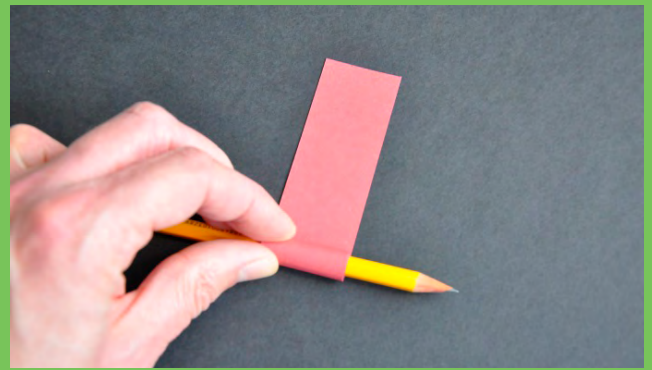


You will need six of these basic units to create the umbrella mechanism.

Step 25



Step 26



Step 27



Fix the tube using adhesive tape.

Step 28



Make two of these tubes.

Step 29



Tape an array of six individual mechanisms, at the point where they slide, around one tube.

Step 30



Tape the ends of the mechanisms to the other tube.

Step 31





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