

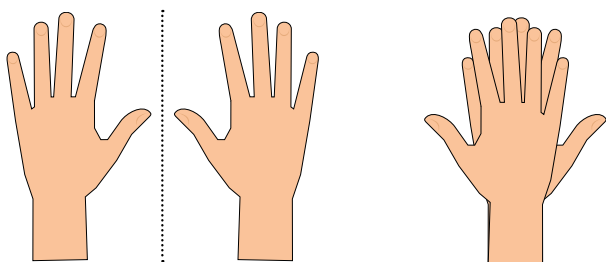
CURIOUSLY CHIRAL CHRISTMAS DECORATIONS

SECTION 1: INTRODUCTION

Hi, my name is Jess, nice to meet you! In my research, I use molecules to create super bright Light-Emitting Diodes (LEDs) that tech companies use to make mobile phones and television screens! The special thing about the molecules I use is that they are **chiral**, but what does chiral mean?

The easiest way to understand of chiral objects is by looking at your hands!

If you hold your hands together on a table, you can see that they are mirror images of each other. But, if you try and put one hand over the other (keeping your palms facing the table), you can see that they won't stack perfectly on top of each other – a fancy word for this is **non-superimposable**.



Your hands are **equal**, but they are also the **opposite** of each other. This means that they are an example of a **chiral pair**.



Just like our hands, lots of other objects are found in chiral pairs too! Can you think of any? Speak with your family. You might think of things like:

- Pairs of shoes
- Gloves
- Left- and right-handed scissors
- Snail shells – the same species of snail can have a right- and left-hand version
- Butterfly wings
- Even spiral pasta can be chiral, as you can have right- and left-handed spirals

Often things that are right- or left-handed can make a chiral pair.

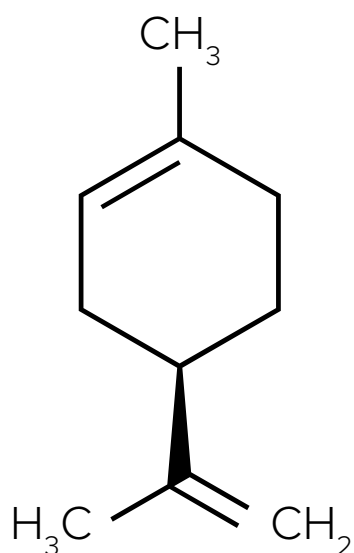
SECTION 2: CHIRAL CHEMISTRY

What you might not know is that some molecules can be chiral too. Just like our hands, we say there is a right- and left-hand version of each molecule.

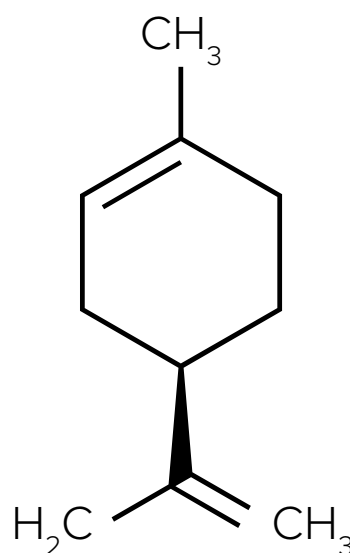
In most situations, it doesn't matter if something is left- or right-handed, but sometimes it **really does matter**. Imagine if you had two right hands, or going out for a walk with two left shoes!

It can make a big difference to molecules too. For example, the smell of lemons and oranges comes from the left- and right-handed form of the same molecule! Our noses have receptors that react in different ways to these molecules!

(R)-limonene



(S)-limonene

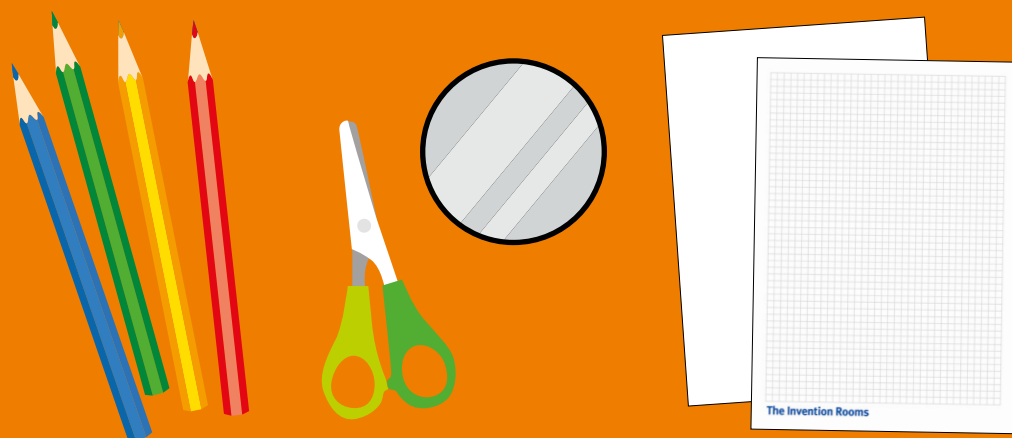


SECTION 3: YOUR CHALLENGE

I use chiral molecules to create new technology, but you can also use chiral shapes to make chiral Christmas decorations!

YOU WILL NEED:

- Paper
- Colouring pencils
- Scissors
- Squared paper
- A mirror

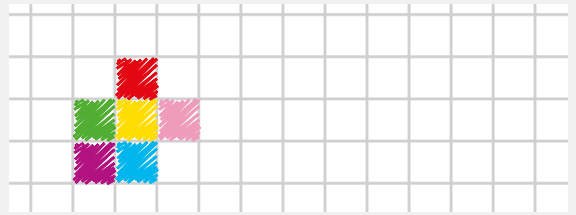


On the next sheet are some shapes that you can cut out. After you've cut them out, you can use the mirror to check that they are mirror images of each other. You should also make sure that the shapes don't stack perfectly on top of each other – an easy way to tell is to make sure that the colour side of the shape is facing up. Once you are happy they really are chiral pairs, use some string to make decorations of them!

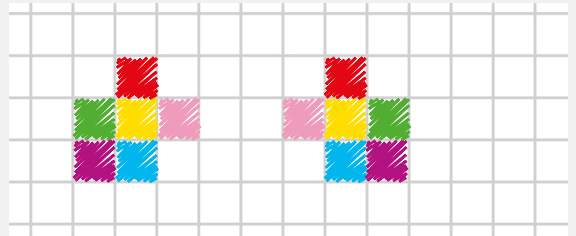


Make your own chiral shapes.

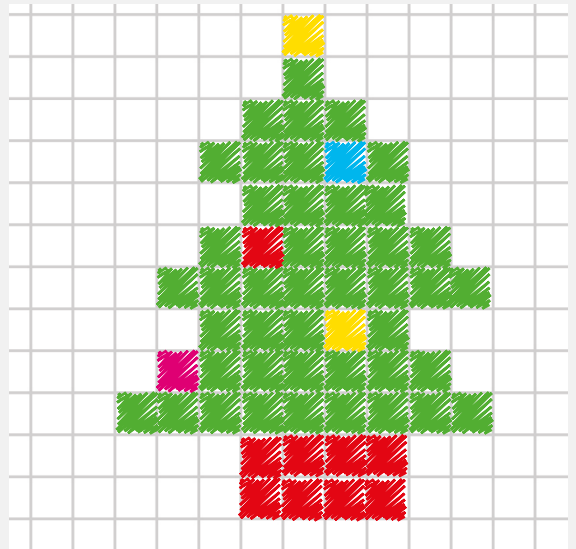
→ 1 Use your pencils to colour in a few squares next to each other using different colours on the squared paper in your book. We recommend starting quite small, just four or five squares.



→ 2 Once you've coloured in a few squares, try and colour in the **matching chiral pair** on the other side. Look at each square and then work out what the mirror image would be.



→ 3 If you are feeling confident, you can try some more complex pictures and shapes. You can also draw a shape on the squared paper and get someone else to draw the matching chiral pair. We like using squared paper as it's very easy to tell if our pairs are the same.



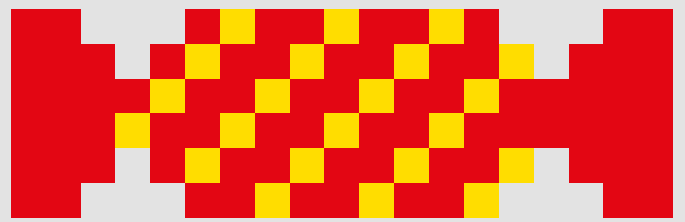
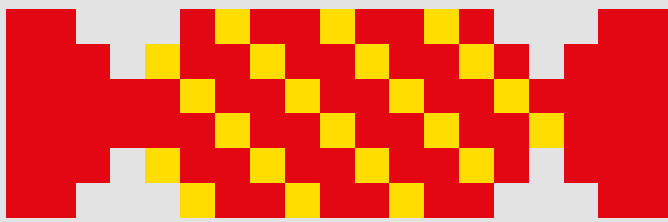
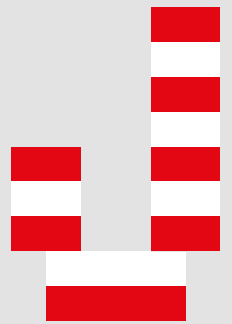
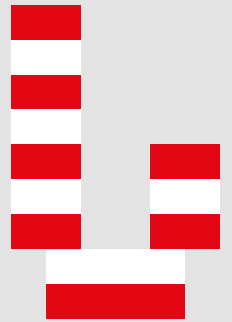
→ 4 When you've finished, it's time to test your two pictures.

Place them next to each other and then use a mirror to look at one. The reflection in the mirror should look like the other shape! Now cut them out and place one over the other, keeping both shapes colour-side up.

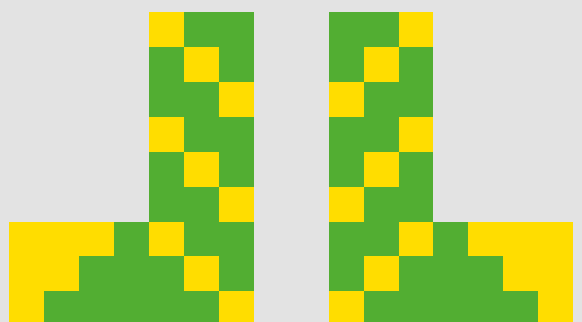
If they **can't** stack on top of each other perfectly – so the colours above match the colours below – then you've made a chiral pair. This is because they are mirror images, but they can't stack perfectly (they're **non-superimposable**).

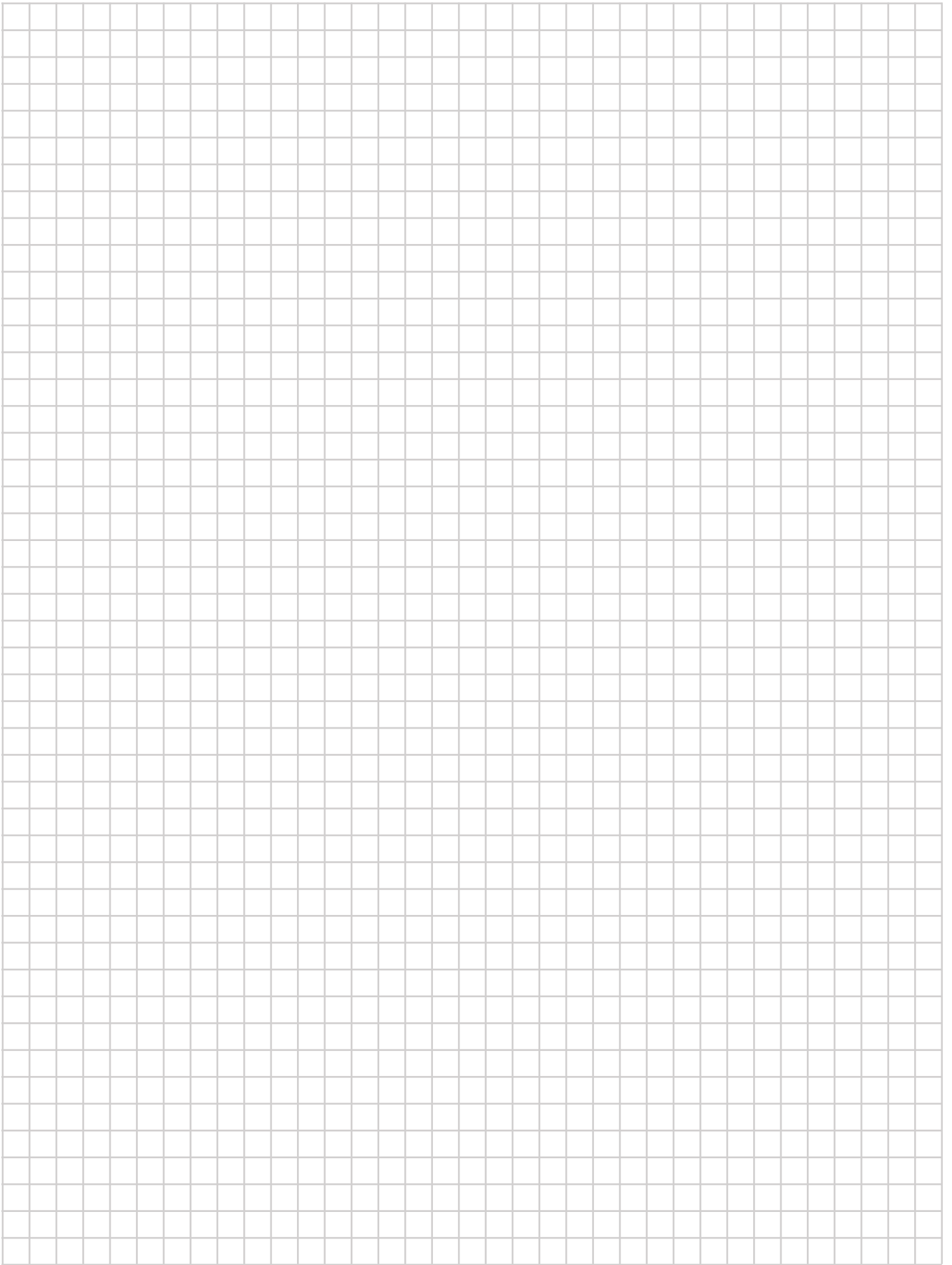
→ 5 Now you are an expert in chiral pairs, why not use the polystyrene balls and pipe cleaners to make some 3D chiral decorations! Remember they have to be mirror images of each other, but when you place one on top of the other, they must not stack perfectly!





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