GEOMETRY

ENQUIRY OF LEARNING Why should we protect the rainforest?

LEARNING QUESTION How will symmetry help me draw the leaf of a rainforest plant?

Our rainforests are some of the most biodiverse places on the planet – and some of the most threatened. They are home to half of the species that live on land, but they are shrinking at an alarming rate. This geometry activity explores the form of the leaves of one of the plants found in the rainforest. It has been developed as part of a Year 3 enquiry of learning about rainforests and what we can do to protect them, but could equally be used in other year groups as part of learning on other themes, or as a standalone activity.

The plant which is the focus of this activity, *philodendron verrucosum*, belongs to a family of plants which can be trees, shrubs or climbers. It has large, distinctive, leathery leaves and is native to the rainforests of Costa Rica, Panama, Colombia, Ecuador and Peru.

YOU WILL NEED

A ruler A pencil A fine black pen A4 paper A compass A good quality eraser Coloured pens, pencils or paints Images of the leaves of *philodendron verrucosum*



If you are adapting this activity to use with younger children, or for students who need additional support, you could provide the vesica created in Step 3 for them. They can use this as a template to draw the leaf. Alternatively, you could draw one half of the leaf for them and ask them to complete the second half.

WHY GEOMETRY?

Learning the geometry of Nature provides students with a new way of looking at the world. The observational skills and careful drawings that are required to recreate this geometry can have a powerful impact on students' understanding of Nature and their place in it. If we are to create a sustainable future, we need to see the world through a different lens, to understand that the patterns of life that exist *around* us, also exist *in* us. This way of seeing the world means we view everything from a place of connection, rather than separation.





STEP 1 Draw a line down the centre of the page

Arrange an A4 piece of paper in portrait orientation. Fold it in half by placing the right hand edge of the page on the left hand edge, pressing to make a crease, then unfolding. Use a ruler to draw a line down the centre of the page along the crease you have made. The line should be almost the full length of the page.

STEP 2 Measure 8cm from the top of the line

Next, measure 8cm from the top of the line and use a pencil to mark this point.



STEP 3 Draw two arcs on the page

Now fold the piece of paper in half again, this time placing the top edge of the page on the bottom edge, pressing to make a crease, then unfolding.

Set your compass to 12cm, then place the point of the compass on the horizontal crease 3cm away from the line you drew down the centre of the page. Use the compass to draw an arc that crosses the central pencil line towards the top of the page and again towards the bottom.

Repeat this process to draw a second arc on the opposite side of the page to the first one. The shape you have created is called a **vesica**.

STEP 4 Draw the outline of the leaf

Use the vesica shape you created in Step 3 as a guide to draw the outline of the leaf. It is roughly heartshaped, with a tear-shaped 'cut-away' section at the top where the leaf forms two lobes, as shown. Use the mark you made 8cm from the top of the central line to help you draw the 'cut-away' section; the bottom of the tear-shape should sit on the 8cm mark.

DID YOU KNOW?

The shape that is created where the two arcs in this activity overlap is called a **vesica** or **vesica piscis** (in Latin, **vesica** means vessel and **piscis** means fish). The vesica piscis is a shape that is found in the traditional art of many different cultures. It also echoes the shape of many fish and this can be explored in our Geometry activity 'How can I use a vesica to draw a fish?'.



STEP 5 Draw the veins of the leaf

Carefully draw in the veins of the leaf, paying close attention to where each vein starts and ends. It may be helpful to start with the single vein that runs down the centre of the leaf from top to bottom. You can use the central line you drew at the very start of this activity as a guide to draw this.

Now draw the other veins. At the top of the leaf, the veins start at a central point and fan outwards. Further down the leaf, they start at the main, central vein then run outwards to the edges of the leaf.



TEACHER TIP

Before starting Step 5, it may be useful to ask students to pause and look carefully at images of the leaves of *philodendron verrucosum* and to discuss their observations. Are the veins arranged symmetrically on each side of the central vein? Is the thickness of each vein uniform or does it taper towards the edge of the leaf?



STEP 6 Outline the leaf in pen

Using a fine black pen, go over the pencil outline of the edges of the leaf. Don't outline the veins, as these will remain white when you colour the leaf.

STEP 7 Add colour to the leaf drawing

It's now time to add colour to the leaf drawing to bring it to life. As your drawing will be fairly large, it will lend itself well to painting, but you can work with coloured pens or pencils if you prefer.

The veins on the leaf are white so when you add colour to your drawing, remember only to add it to the sections between the veins and not to the veins themselves. To make the colour more realistic, use darker greens towards the outside of each section of the leaf and use lighter greens towards the centre of each section.





-